FORESTRY ABSTRACTS

VOLUME 13 1951 NUMBER 2

THE CHIEF RESEARCH CENTRES FOR FORESTRY AND WOOD UTILIZATION IN CONTINENTAL EUROPE

EXCLUDING MOST OF THE BALKAN PENINSULA AND EASTERN EUROPE

IT is now over 6 years since World War II ended. Although the pattern of forestry research has not yet everywhere clearly emerged, a conspectus of information collected by this Bureau, partly through its scanning of literature and partly through the kindness of its numerous Foreign Correspondents and contacts, may be found useful. A beginning is made below, with a précis, necessarily somewhat uneven in quality, for the more accessible countries of Europe. In each case the précis follows the order:—1. Origin, growth and administrative set-up. 2. Main sections and scientific cadre. 3. Sub-stations, arboreta, etc. 4. Chief research items. The Bureau would be grateful for early intimation of any new research centres or developments, wheresoever they may arise, so that up-to-date information may from time to time be made available.

AUSTRIA

(1) Forstliche Bundes-Versuchsanstalt, Mariabrunn

1. The Federal Forest Research Institute arose out of the K.K. Forstliche Versuchsleitung which was founded in 1875 under the Ministry of Agriculture in Vienna and was transferred, 12 years later, to Mariabrunn, to premises once a monastery and later a forestry training school. Here it first took the name of K.K. Forstliche Versuchsanstalt. Between the wars the Institute suffered severely from lack of funds, and towards the end of World War II, its buildings, equipment and experimental plots sustained heavy damage, both from explosives and from looting. Repair and rehabilitation are now in the main complete.
2. Three sections are now operating:—silviculture (formation of stands, tree breeding and seed testing); tending and yield studies; chemical and mechanical wood technology, resin tapping, and other minor forest products. Efforts are being made to revive the sections for logging and forest protection. Most of the 200 experimental plots, distributed all over Austria, are devoted to the study of exotics and to yield and thinning research.
3. The number of research workers, including the Director who is usually the senior head of a section, is at present 5.
4. Research has only lately been resumed on a modest scale. It includes tree breeding (particularly Poplar), seed testing, resin tapping of *Pinus nigra* and *P. sylvestris*, and the testing of wood preservatives. Data from various long-term yield studies are also being collected and worked up.

(2) Österreichische Gesellschaft für Holzforschung, Wien

1. The Ö.G.H. (Austrian Society for Wood Research) at Vienna was formed for the purpose of promoting, on a non-profit basis, research into the production, extraction and utilization of wood. A revised constitution was approved in April 1951. The work sponsored by Ö.G.H. is at present carried on at existing research centres.
2. The activities of the Ö.G.H. are divided between 11 committees: wood 'biology' (including anatomy and injurious biological agencies); timber growing and felling operations; logging (extraction); primary conversion; secondary conversion and processing; wood in building construction; wood-waste utilization; timber protection and preservation; wood chemistry (including pulp and lignin); resin-tapping, wood distillation and saccharification; documentation. A total of over 70 research scientists (12 being foreign) are collaborating.
4. Subjects now being investigated include: microscopic investigation of insulating fibreboards; determination of the spring/summerwood ratio in softwoods; technique of Larch tapping; Poplar growing; skidding and cableway equipment; structure and decomposition products of cellulose and lignin.

CHIEF FOREST RESEARCH CENTRES IN CONTINENTAL EUROPE

BELGIUM

Forest research in Belgium being in course of reorganization and expansion, details of the various new centres are necessarily incomplete.

(1) Station de Recherches Forestières de Groenendael, Groenendael

1. This station was founded in 1898.
2. It has 3 main sections: silviculture/genetics; forest biology and protection; hydrobiology. It employs 7 research scientists.

(2) Centrum voor Bosbiologie in de Limburgse Kempen, Bokrijck-Genck

1–2. This centre for Forest Biology in the Limbourg Kempen was founded in 1948. It has 4 sections: ecology, soil science, zoology and genetics, and employs 4 research scientists.
4. Current studies include: ecology of heathlands; natural forest and plantations; soil fauna under Scots Pine, Oak and heath; insect pests; genetic improvement of Scots Pine.

(3) Institut de Populiculture, Union Allumettière, Grammont

This Poplar Institute was founded in 1947 by the Union Allumettière (Match Manufacturers' Union); its work is the improvement and cultivation of Poplar, especially the breeding of new hybrids and polyploids.

(4) Laboratorium voor Houttechnologie, Rijkslandbouwhogeschool, Gent

1. The Laboratory of Wood Technology was founded in 1948, and set up within the section of Tropical Botany and Forestry at the State Agricultural College (Rijkslandbouwhogeschool).
2–3. It is divided into 3 sections: wood preservation and durability tests of Congo woods; wood anatomy and identification; kiln drying. There are no subsidiary centres.
4. The chief subjects now being actively investigated are:
The preservative properties of creosote and its constituents; and the durability of Congo woods.

(5) Laboratoire forestier de l'État, Gembloux

1. The State Forest Laboratory was started in 1920 under the name 'Station de Recherches forestières', assuming its present title in 1946. It is housed in the Institut Agronomique de Gembloux.
2. It has 4 main sections: wood technology (anatomy, physical and mechanical properties, and preservation); seed testing; pruning for timber quality; wood industry statistics.
There are 4 research scientists; one being subsidized by the Institut National pour l'Étude agronomique du Congo Belge (INEAC). Close collaboration is maintained with the Institut Agronomique in respect particularly of pulp and pulping.
4. All the items in 2. above are being actively investigated, particularly the properties of timbers from the Belgian Congo.
Some research in wood technology is also done by the Laboratoire de Technologie, Institut Agronomique de l'Université de Louvain.

DENMARK

(1) Statens Forstlige Forsøgsvæsen, Springforbi

1. The State Forest Experiment Station was established in 1901. It covers research on forestry proper as well as some wood technology. The Station is under the Ministry of Agriculture and is directed by a commission consisting of the director of the Station, 2 representatives of the Danish Forest Service, 2 representatives of the privately-owned forests, and one representative of the school of forestry. It is financed by the State.
2–3. The scientific staff consists of the director and 7 graduates in forestry. There is a subsidiary centre at Bybæk in Jutland, specializing in the purely silvicultural problems involved in the afforestation of heathlands and sandy areas, covering methods and species for the afforestation of open land and for the regeneration of plantations already established.
4. The most important current investigations include: growth studies of indigenous and exotic species; the influence of different thinning methods on the quality and quantity of the crop; the value of different planting methods; provenance investigations, chiefly of Oak, Beech, Norway Spruce, Sitka Spruce, Douglas Fir and Larches; and soil analysis.

(2) Træindustriens Forskningsudvalg, Copenhagen

1. The Research Committee of the Woodworking Industry was established in 1949 by the Academy of Technical Science. Its work is financed by the various wood industries and by the Danish Forestry Society. The Committee consists of representatives of the forest and wood industries, the Academy

of Technical Science, the Technical School, the Technological Institute and the silvicultural section of the Royal Veterinary and Agricultural College.
2–3. The experimental work is directed by a civil engineer. As the Committee has no laboratories of its own, the work is carried out at the laboratories of sawmills, factories and other institutions. The committee plans to establish a section for wood research, especially the utilization of wood waste.
4. Current research includes: the use of conical circular saws; the preservation of sawn Beech products; and the analysis of recovery from different types of saws.

(3) Arboretet, Hørsholm

1. This Arboretum, founded in 1936 with the aim of gradually replacing the old Forest Botanical Garden at Charlottenlund, is an independent branch of the Kongelige Veterinær- og Landbohøjskole (Royal Veterinary and Agricultural College). Its work includes research on tree breeding, this being financed partly by the State and partly by private funds.
2. The scientific staff consists of the director and 4 others, all graduates in forestry.
4. The main emphasis in tree-breeding research is on: propagation of valuable seed trees; cross-breeding experiments; the production of polyploid trees; and the elaboration of methods of tree-breeding and their adaptation for use in practical forestry.

(4) Statsskovenes Planteavlsstation, Humlebæk

The Forest Service Plant Rearing Station at Krogerup near Humlebæk was established by the Forest Service in 1948, to further the use in practical forestry of experimental results from tree-breeding work. The activities of the station are divided between the establishment of seed orchards in the State forests, and the production of planting stock of high genetical quality. A collection of selected clones of certain species—in the first instance Larches, Ash, Silver Fir, Norway Spruce and Douglas Fir—is being formed in order to maintain these strains for breeding and for long-term studies of clonal characters and behaviour. The Station has a modern seed-extraction plant, with provision for storage.

In 1951 the first private forest tree-breeding association was formed.

Both these organizations work in close contact with the Hørsholm Arboretum.

FINLAND

(1) Metsätieteellinen Tutkimuslaitos, Helsinki

1. The Forest Research Institute was founded in 1918 for the study of forestry other than forest products and utilization; forest technology was added later. Its activities are planned and supervised by a Council consisting of the professors and Chief Forest Officer of the Institute and responsible to the Minister of Agriculture, who on the Council's recommendation appoints one of the professors as head of the institute for a term of 5 years.
2. There are 6 sections: silviculture (and fundamentals), mensuration (including national forest surveys), forest economics, forest technology (e.g. tool and work studies), forest soils, and bog reclamation. The silviculture section includes a Professor of Forest Biology and the Government Inspector for the Protection of Nature.
3. The Institute's experimental forests and nature-protection areas in different parts of the country are supervised by the Chief Forest Officer and his field staff. The total of research scientists on the Institute staff is 16, excluding those temporarily engaged for the national forest survey.
4. Among the chief subjects of study are the following: inventories of the nation's forests and their utilization (the third such inventory is in progress); forest site determination and assessment; increment and yield of the major species and of mixed stands; bog drainage for afforestation, and connected problems in natural and artificial regeneration.

(2) Laboratory of Wood Technology, Helsinki

1. This section of the State Institute for Technical Research (Valtion Teknillinen Tutkimuslaitos, under the Ministry of Trade and Industry) was created in 1942, out of the state- and industry-supported Institute for Forest Products Research. Its Director, who is assisted by an advisory committee, controls a total staff of 20.
2–4. There are 6 sections: wood structure and properties; woodworking; gluing and surface treatment; seasoning; preservation; waste wood. The work of the wood-structure section is co-ordinated with the wooden-house structure section of the Laboratory of Building Technology. Fire-proofing studies are undertaken by the Impregnation Division of the Fire Technical Laboratory.

Research in wood chemistry is largely centralized at Industrins Centrallaboratorium A.B. (Central Laboratory Ltd.) at Helsinki, founded in 1916, which is maintained, like (2) above, by industry, particularly the pulp and paper interests. Intensive study of the chemistry of Birch (*Betula verrucosa*),

both wood and bark, is also carried on at the Institutet för Träkemi (Institute of Wood Chemistry) at Åbo.

(3) **Metsäteho, Suomen Puunjalostusteollisuuden Keskusliiton metsätyöntutkimustoimisto, Helsinki** (Forest Work Studies Section of the Central Association of Finnish Woodworking Industries)

1. Metsäteho was set up in 1945 by various forest-industry companies and associations, well over 100 now being members, as well as the State Fuel Acquisition Bureau. It is run by a council, consisting of the chief foresters of the larger concerns and including representatives of the forest workers' own associations.

4. The special problems of cutting, loading and transport are intensively studied with a view to increased efficiency and also the rationalization of forest business as a whole. With these are linked the determination of fair wage standards.

Similar work is undertaken by the forest section of the Työtehoseura (Work Efficiency Association).

FRANCE

(1) Station de Recherches et Expériences Forestières, Nancy

1–2. This, the first Forest Research Station in France, was set up by a departmental order of 1882 as an annexe to the National Forestry School at Nancy. It functioned on a modest scale till 1920, when four sections of research were created, viz. general research, botany, zoology and headwaters protection, the last 3 being under the respective professors of the School. A wood-testing laboratory was also set up, and has continued in being to the present day, devoted to the study of wood in relation to conditions of growth. Finally a thorough reorganization was effected in 1937, with the creation of 7 sections, as follows: (*a*) general forest research (chiefly growth and yield of the main tree species of France; also *Pinus pinaster* resin-tapping), (*b*) botany and pathology, (*c*) applied ecology and genetics, including seed and nursery work, (*d*) logging (in conjunction with the Central Timber Testing Laboratory in Paris—see (2) below) and the rational utilization of wood, (*e*) forest soils, (*f*) zoology, chiefly insects but also hydrobiology, (*g*) mountain management, i.e. the forestry and grazing sides of upland economy. The current staff includes a total of 18 research scientists.

4. Among the chief items of research are: a comprehensive and intensive study of measures to improve, especially by enrichment with new species, the country's extensive areas of coppice and coppice-with-standards; the rehabilitation of the Pine forests of the Landes, including detailed fire control research; the restoration of Chestnut stands and propagation of Poplar (under 2 special commissions); natural regeneration of Corsican Pine; mistletoe suppression; barkbeetle control. The wood-testing laboratory has recently been engaged on extensive, detailed tests in co-operation with French mining interests, of the chief native and exotic species grown in France and used as mine timber.

(2) Institut National du Bois, Paris

1. This semi-official establishment (The National Wood Institute) was created in 1933 by the Forest Administration and the principal trade organizations, in collaboration with the Enseignement Technique (Service of Technical Instruction). Installed with it a few years later, and practically united into one organization, although on financial and administrative grounds each keeps its separate title, is the *Laboratoire Central d'Essais des Bois* (Central Timber-Testing Laboratory), which the Forest Administration created in 1936. The Institut specializes in the teaching side and documentation (Centre de Documentation), the Laboratoire in the fundamentals of general wood research.

2–4. To this end, the latter has 3 sections, biological (anatomy, insects and fungi), physical and mechanical, and chemical, each with a basic and applied research programme. The Laboratoire also undertakes studies, tests and analyses on behalf of private individuals, firms and Government departments. On the applied side, the Institut's laboratory has a *Section d'applications industrielles* devoted to research on seasoning, impregnation, glues and varnishes, machining, testing of members and structural units.

The total number of research scientists employed is 8.

(3) Centre Technique Forestier Tropical, Nogent-sur-Marne (Seine), nr. Paris

1. The C.T.F.T. (Technical Centre for Tropical Forestry) originated in an organization established in 1917 within the Ministry for the Army and called 'Section des Bois Coloniaux'. Transferred in 1921 to the Ministry for the Colonies, the Section was later successively called 'Service Technique des Bois Coloniaux' and 'Section Technique Forestière'. The C.T.F.T. itself was authorized by an order of the Ministre de la France d'Outre-mer, dated 10 May, 1949. Administratively attached to the Section Technique d'Agriculture Tropicale, it is run by a managing committee under the guidance of an administrative council and functions much like an ordinary commercial establishment. Its main purpose is to undertake research on the exploitation, utilization and silviculture of the forests of French tropical Africa.

2. The C.T.F.T. is now divided into 6 sections: wood anatomy, wood chemistry, exploitation of tropical forests, wood preservation, wood technology, botany, and documentation. Besides the Director, there are now 12 research scientists.

4. The chief subjects now being investigated are: the anatomy and the physical, mechanical and chemical properties of tropical woods from the French colonies; sawing; the possibilities of increasing the construction of wooden houses in the tropics and their standard design; the preservation of tropical woods.

(4) Laboratoire de l'Institut du Pin, Bordeaux

1. The Laboratories of the Pine Institute are housed in the Faculty of Sciences of Bordeaux University and concentrate on all problems relating to Maritime Pine (*Pinus pinaster*) from its silviculture to its resinous products and their derivatives.

2–4. There are 3 laboratories, the largest being that for the chemistry and use of resinous products, which includes a staff of 9 research scientists. It is supported by a physics laboratory. The third laboratory, for forest biology, studies the varied problems of Maritime Pine propagation, tending and protection (particularly from barkbeetles) in the Landes region.

(5) Laboratoire de l'École Française de Papeterie de Grenoble

This Laboratoire (Laboratory of the French School of Papermaking) consists of: (1) an experimental papermaking plant; (2) laboratories for physical, chemical and micrographic tests on pulp, paper and paperboard; (3) a laboratory for the manufacture and testing of paper and pulp; (4) a reference bureau, for the particular use of manufacturers.

The laboratory studies all vegetable fibres and particularly native timbers, with reference to their better use in papermaking. A broad programme of research is being carried out in co-operation with the Laboratoires des Services Chimiques de l'État for improved utilization of coppice woods such as Beech, Elm, Poplar, Lime and Birch.

GERMANY

Published and private sources alike present a patchy and confused picture of forestry research in post-war Germany. Much reorganization and regrouping is still going on. In these circumstances it has been thought proper to give in considerable detail what is definitely known about the organizations of country-wide scope and to add more briefly, such current data for local centres as seems reliable and useful.

GENERAL

(1) Bundesanstalt für Forst- und Holzwirtschaft, Reinbek

1. Research in the whole field of forestry and the utilization of forest products is conducted on a country-wide basis at the Bundesanstalt für Forst- und Holzwirtschaft (Federal Institute for Forestry and Timber Economy), Reinbek, near Hamburg. This Institute developed out of the Institut für Ausländische und Koloniale Forstwirtschaft (Institute of Foreign and Colonial Forestry) founded in 1930 under the Tharandt College of Forestry, but subsequently subordinated directly to the Reichsforstamt, raised to the status of Reichsinstitut, and shifted to Reinbek in 1939. The Institute escaped war damage and in 1947 was subordinated to the Ministry of Food, Agriculture and Forests under the title of Zentralanstalt für Forst- und Holzwirtschaft, later amended to the present title. The office of Presiding Director is held alternately, for periods of one year, by the Directors of the two sections (see next paragraph) into which the Institute is divided. General policy is determined by a board comprising the Chief of the Forestry and Timber Section of the Ministry, a senator of the educational authority of Hamburg, and a representative from one of the leading scientific organizations of the Republic. In addition, an Advisory Council exists to ensure a broad basis for the Institute's work and to promote close contact with practice in forestry and the wood industries, representatives of which are members of the Council. Close association is also maintained with the University of Hamburg; the two Directors of the main sections of the Institute hold chairs, and many other of its members also act as teachers, in the University.

2. There are two main sections ('*Institute*'):—

(*a*) For forestry—with subsections for: soil science and ecology; forest genetics and breeding; silviculture and forest protection; forest engineering and utilization, including minor forest products; and forest and timber policy. The research scientists engaged in this section total 15.

(*b*) For wood research—with subsections for: biology and protection of wood (including forest botany and wood anatomy, biological agencies injurious to wood, and wood preservati[illegible]; cell-wall

research and pulp chemistry; wood chemistry; and wood physics and technology. The scientific staff in this section totals 10.

4. The Institute exists primarily to deal with country-wide rather than regional problems. Its work is dominated by problems associated with timber shortage and therefore falls under two main heads: (i) research directed towards the improvement of the yield of German forests; and (ii) research on the rational utilization of wood, whether home-grown or imported, and in the latter case, whether temperate or tropical.

In the Forestry Section some of the chief items of research are: soil studies proper, especially of N. German soils, but also including comparative studies of temperate and tropical soils; soils and the root ecology of promising exotics and hybrids, e.g. Douglas Fir, Sitka Spruce, Poplars and Osier Willows; hybridization and selection, at present chiefly of Larches and Poplars; vegetative propagation, particularly with a view to the establishment of seed orchards; silviculture and yield studies especially of exotics, regional yield studies in Germany, comparative yield studies of temperate and tropical species and of virgin forest; pests and diseases, especially of exotics; testing of new insecticides; testing of new forest transport systems and equipment, frictional studies of forest road surfaces; medicinal plants, essential oils and other minor forest products; problems of timber statistics and supply, preparation of a handbook of world forestry and a world forestry atlas, and preparatory work towards a forest inventory of Germany.

In the Wood Research Section, noteworthy items are: studies in forest botany and wood anatomy, including that of tropical woods; the biology of fungi and pests of converted wood, including termites (in view of German exports of manufactured wooden goods); work on preservation and preservatives and the development of improved testing methods; chemical aspects of the behaviour of solid wood and chips under pressure and heat, with special reference to the behaviour of wood during high-temperature seasoning, application to the use of waste wood in moulded products etc.; pulping of hardwoods; lignin chemistry; analytical methods in wood chemistry; isolation of substances influencing natural durability; isolation of sterols from Pine wood with a view to pharmaceutical uses; work on resins as raw materials for synthetic products; studies on many aspects of wood physics and mechanical strength, e.g. studies on moisture relations and the development of rapid, high-temperature seasoning methods, the mechanics of shrinkage and collapse, moisture conditioning of plywood, fibreboards etc., studies of the elastic behaviour of wood, and the completion of factual data on the properties of individual woods.

(2) Institut für Forstliche Arbeitswissenschaft (Iffa), Reinbek

1. In 1927 the Gesellschaft für Forstliche Arbeitswissenschaft e.V. (Association for Forest Work Studies) was formed with the support of foresters, tool manufacturers, and various other interested private and State bodies. Its research institute, 'Iffa', was founded in the same year at Eberswalde. Later, the Reichsforstamt and the Reichsforschungsamt were the chief supporters of the Association, but, of its own choice, it remained an independent body. In 1945 the Institute was transferred to new quarters at Vorwerksbusch, Reinbek, near Hamburg.

2–3. The Institute is not divided into sections, only three research scientists being engaged at its headquarters, but a field station is maintained at Münchehof, near Seesen, with two further research workers having the task of determining basic piecework rates for woodcutters on behalf of five regional forest administrations and the workers' unions.

4. The chief features of the Institute's work are: studies on the physiology of heavy manual labour in the forest (in co-operation with the Max-Planck Institute of Work Physiology, Dortmund) and the improvement of tools and working methods as regards energy expenditure; actual working tests of tool efficiency; development of the best work technique in any forestry operations; and performance studies to determine fair piece rates and to form the basis of economic calculations. The Association also concerns itself with instructional courses and the dissemination of knowledge in this field by practical instructional pamphlets, pictures, films, etc.

(3-4) Biologische Zentralanstalt für Land- und Forstwirtschaft, Berlin-Dahlem and Biologische Bundesanstalt für Land- und Forstwirtschaft, Brunswick

These two bodies represent the former Biologische Reichsanstalt für Land- und Forstwirtschaft (Reich Institute of Biology for Agriculture and Forestry), founded in 1898. The headquarters at Berlin-Dahlem suffered badly during the war. Since the war, this centre has been subordinate to and maintained by the Agriculture and Forestry authority of the Eastern Zone under the new title of Biologische Zentralanstalt (Central Institute . . .) and has renewed contact with its several substations in that zone. Of its 6 sections, with a total scientific staff of ca. 30, those of chief interest to forestry are probably the sections of: mycology; agricultural zoology; and plant protection products and apparatus.

Substations in Western Germany united after the war to form the Biologische Bundesanstalt (Federal nstitute . . .), at Brunswick, which has two substations of interest to forestry:

(*a*) An institute of applied mycology and timber protection, at Hann. Münden; and

(*b*) A station for testing plant protection products and apparatus, at Brunswick.

Contact is still maintained between the Zentralanstalt and the Bundesanstalt, but they remain distinct s institutions.

Available data for the more regional and local centres are given below:

BADEN

5) Forstliche Fakultät der Univ. Freiburg i.Br. (Faculty of Forestry, University of Freiburg i.Br.)

2. There are sections ('*Institute*') for: soil science; forest zoology; forest botany; silviculture; yield tudies and wood research; management, economics, policy; and forest history.

N.B.—The section of yield studies and wood research simultaneously represents the:

6) Badische Forstliche Versuchsanstalt (Baden Forest Research Institute)

BAYERN (BAVARIA)

7) Forstliche Forschungsanstalt München (Munich Forest Research Institute)

2. Includes sections ('*Institute*') for: meteorology; soil science and site studies; applied zoology; game studies; forest botany; silviculture; seed studies, genetics and plant rearing; yield studies and management; economics and management policy; wood technology and forest utilization.

BERLIN

8) Institut für Chemische Holztechnologie, Forstwirtschaftliche Fakultät der Universität (Institute of Chemical Wood Technology, Faculty of Forestry of the University)

EBERSWALDE

9) Forstliche Fakultät (Faculty of Forestry)

2. Includes sections ('*Institute*') for: forest meteorology; soil science; forest zoology; forest botany; silviculture; forest protection; management and yield studies; forest policy and economics and forest utilization.

10) Forstliche Versuchsanstalt (Forest Research Institute)

2. There exist sections for yield studies and forest protection.

HAMBURG

11) Technische Zentralstelle der Deutschen Forstwirtschaft, Hamburg-Bahrenfeld (Central Technical Office for Germany Forestry)

Has been concerned with the technique of reforestation, stumpwood utilization, timber protection and timber economy.

HESSEN

12) Hessische Forsteinrichtungs- u. Versuchsanstalt, Giessen (Hessian Forest Management and Research Institute)

13) Institut für Zellulosechemie (einschl. Holzforschungsstelle) der Technischen Hochschule Darmstadt (Institute for Cellulose Chemistry (including the Wood Research Centre) of the Darmstadt College of Technology)

NIEDERSACHSEN

14) Forstliche Fakultät der Univ. Göttingen, Hann. Münden (Faculty of Forestry, University of Göttingen)

2. Includes sections ('*Institute*') for: soil science; forest zoology; game studies; forest botany and mycology; fundamentals of silviculture; silvicultural technique; management and yield studies (this simultaneously represents section (*a*) of the Niedersächsische Forstliche Versuchsanstalt); forest policy and economics; forest history and law; forest utilization, including wood research, logging and work studies.

15) Niedersächsische Forstliche Versuchsanstalt (Forest Research Institute of Lower Saxony)

2–3. This has sections or substations for:

(*a*) Forest management and yield studies, at Hann. Münden (the section of management and yield studies in the preceding institution simultaneously represents this section of the Versuchsanstalt).

(*b*) Disease and pest control at Sieber, Harz.

(16) Institut für Holzforschung des Vereins für Technische Holzfragen e.V. (Wood Research Institute of the Association for Technical Timber Problems)

This Institute has been concerned chiefly with work on the utilization of waste wood, the manufacture of fibreboards, and timber protection.

(17) Zentralstelle für Vegetationskartierung, Stolzenau/Weser (Central Office for Vegetation Mapping)

Has been concerned with plant sociology and vegetation mapping methods in both forest and other vegetation types. It is maintained from public funds and has a scientific staff of about 11.

NORDRHEIN-WESTFALEN

(18) Forstliche Versuchsanstalt Nordrhein-Westfalen, Düsseldorf (North Rhine-Westphalia Forest Research Institute)

1. Includes sections ('*Institute*') for: silviculture; yield and increment studies.

THARANDT

(19) Forstliche Fakultät (Faculty of Forestry)

2. Is divided into sections ('*Institute*') for: soil science and site studies; zoology; forest botany; silviculture; yield studies; surveying; management; economics; plant chemistry and wood research; forest utilization including game management.

WÜRTTEMBERG-BADEN

(20) Württembergische Forstliche Versuchsanstalt, Tübingen (Württemberg Forest Research Institute), with a substation at Weil im Dorf.

(21) Württembergische Forstschutzstelle Süd-West (Württemberg Forest Protection Centre S.W.)

(22) Institut für Chemie des Holzes and Polysaccharide der Univ. Heidelberg (Institute for the Chemistry of Wood and Polysaccharides, University of Heidelberg)

(23) Institut für Technische Holzforschung der Technischen Hochschule Stuttgart (Institute for Wood Research, Stuttgart College of Technology)

GREECE

(1) The Forest Research Institute, Athens

1. Research in all branches of forestry is centralized at this Institute, which was founded in September 1944, as the successor to the 15-year-old "Office of Forest Research". It comes under the Forest Administration in the Ministry of Agriculture. In 1948 a laboratory was set up within the Institute for the study of wood technology and other forest products. The Institute is now moving into a new building with modern equipment and increased provision for research.
2. There is no division into sections. The Chief of the Institute has 6 research officers under him, one of whom is a specialist in wood chemistry.
4. Current subjects of study include: seed provenance and nursery techniques; natural regeneration of coppice and high forest, particularly by group and strip systems; pruning of Pines; raising of Eucalypts and Poplars; wood identification and properties; wood distillation and charcoal; minor forest produce; meteorological studies; Pine processionary moth and Chestnut blight.

ICELAND

There is as yet no special research centre but a staff of 8 trained foresters is experimenting with exotic species, chiefly conifers, suitable to the rigorous conditions.

ITALY

(1) Stazione Sperimentale di Selvicoltura, Firenze

1. The Forest Experiment Station at Florence was founded under a law of 1922 and from 1924 to 1929 functioned as a branch of the R. Istituto Superiore Forestale Nazionale of Florence. By a law of 1929 the Experiment Station was separated from the Institute and made into an autonomous institution under the Ministry of Agriculture and Forestry. It works, however, in close co-operation with the State Forest Service (Direzione Generale delle Foreste) and the Faculty of Forestry of Florence University.
2. The Director's staff includes 3 research scientists.
3. Research and teaching are largely carried on at the State Forest of Vallombrosa, where there are also an arboretum, a forest nursery, and a dendrological museum.

In 1951 the National Research Council set up a Chestnut Research Centre (Centro di Studi del Castagno) in connexion with the Experiment Station.

4. The principal current subjects of research are: techniques of afforestation for different ecological environments (e.g. clay soils in the Apennines, and various eroded and degraded soils); special studies of the more important forest tree species; genetical studies, particularly of Scots Pine, Silver Fir and European Larch, and the creation of a national register of seed sources; introduction of exotic species; and control of Chestnut blight (*Endothia parasitica*).

(2) Istituto di Sperimentazione per la Pioppicultura, Casale Monferrato

1. The Experimental Institute for Poplar-growing was founded (in 1935) and is maintained, by a paper manufacturing company, the S.A. Cartiere Burgo. An experimental estate of 625 acres, situated on alluvial soil in a meander of the River Po, is annexed to the Institute.
2–3. There are 3 sections: biology and silviculture; pathology and entomology; and technology and economics, each directed by a research scientist. There are no subsidiary centres.
4. The principal research projects are: the breeding of improved Poplar clones by natural and artificial hybridization and modification of chromosome number by colchicine treatment; possibilities of Poplar growing in Central and Southern Italy; silvicultural techniques, particularly spacing, financial rotations, pruning, fertilizing and inter-cropping; control of disease and insect pests.

NETHERLANDS

(1) Bosbouwproefstation T.N.O., Wageningen

1. The Bosbouwproefstation (Forest Research Station) was founded in 1947 by the Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Central Organization for Research in Applied Natural Sciences). Most of the money came from the State, but part was subscribed by forest owners and forest workers through the Federation of Agriculture.
2. The station is divided into 3 sections, dealing with: research on site factors; growth and yield of exotic and native species; and tree selection and breeding in close connexion with problems of forest pathology. There are 3 research scientists.
4. The main items of research are: the correlation of site type or soil type with the growth of forest trees, especially exotics; the influence of exotics on site and soil; the evolution of variable soil factors in natural and artificial stands; volume tables for Japanese Larch; the most desirable size for sample plots, and its effect on the accuracy of results; provenance trials with Scots Pine; the selection of élite trees for the establishment of seed plantations; hybridization between Japanese and European Larch; and Poplar breeding.

(2) Instituut voor Bosbouwkundig Onderzoek, Wageningen

1. This Institute of Forest Research is a division of the Landbouwhogeschool (Agricultural College) and combines research and teaching activities.
2. It is divided into 3 sections: management, mensuration, valuation, and silviculture and forest protection in the tropics; silviculture and forest protection in temperate regions; exploitation and economics. The scientific staff number 6.
4. Subjects of research include: Poplars; provenances and climatological races of exotic trees, especially of Douglas Fir, Larch and *Quercus borealis* var. *maxima;* methods of thinnings and management; the influence on the soil of an understorey of different kinds of broadleaved trees and shrubs; application of growth hormones to stimulate the rooting of cuttings of forest trees.

(3) Laboratorium voor Algemene Plantkunde, Wageningen

1. This Laboratory for General Botany is a department of the Landbouwhogeschool (Agricultural College). Like (2) above it combines research and teaching activities.
2. It has no formal sections or branches; there are 3 to 5 research scientists on the staff.
4. Research subjects include: the effects of growth hormones on cambial activity, on the development of tyloses, on leaf abscission and on fruit development; the structure of rays; and hand-lens and microscopical descriptions of Surinam wood collections.

(4) Instituut voor Toegepast Biologisch Onderzoek in de Natuur, Oosterbeek

1–3. This Institute for Applied Biological Research is a branch of the Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek (Central Organization for Research in Applied Natural Sciences). Its activities are guided by various committees including those for the study and control of diseases in Elms and other species, and for the study and control of insect pests in forests. The staff includes 9 research scientists, with 5 assistants.
4. Recent and current subjects of research include: analysis of the faunal communities of a Beech forest floor, and other studies of the fauna of the litter layer; the microclimatic properties of sheltered

areas; other studies on the effect of plantations and hedges on microclimate, soil, and crops; the extent of wind erosion in Holland; the resistance of Elm hybrids to *Ceratostomella ulmi* and *Nectria cinnabarina;* damage to *Picea abies* by *Leptothyrium* and to American Oak by an unidentified fungus; and the extent of damage by common insect pests including *Elatobium abietinum*, *Cephaleia alpina*, *Ips typographus*, *Diprion pini* and *Hylobius abietis*.

(5) Houtinstituut T.N.O., Delft

1. The Houtinstituut T.N.O. (Wood Institute of the Organization for Research in Applied Natural Sciences) was until 1951 the Afdeling Hout, Centraal Instituut voor Materiaal Onderzoek (Wood Section, Central Institute for Research on Materials).
2. There are 7 sections: wood anatomy, decay, preservation, improvement (including improved woods, use of wood waste, and plywoods and veneers), chemistry, physical and mechanical properties, documentation and information. There are 4 research scientists.
4. Subjects of research include: a universal method of wood identification (in co-ordination with the U.S. Forest Products Laboratory, Madison); the structure and chemical composition of ancient wood; the use of electron microscopy in wood anatomy; comparative tests on wood preservatives; and the adhesion of paint to wood.

(6) Afdeling Tropische Producten, Koninklijke Vereniging Indisch Instituut, Amsterdam (Tropical Products Section of the Royal Institute for the Indies)

Does some research on wood and wood products, chiefly from tropical regions. Research subjects include infestation of furniture by termites; damage to Limba by lymexylonid beetles; the use of Brazilian and Surinam timbers for sleepers; specific gravity of different timbers; and damage to tropical wood by marine borers round the coast of Holland.

NORWAY

(1) Norske Skogforsøksvesen, Vollebekk

1. Forestry research in all its branches, except utilization proper, is conducted at the Norske Skogforsøksvesen (Norwegian Forest Research Station). Founded in 1917, it is an independent State institution under the Ministry of Agriculture, directed by the 9-member State Forest Research Commission representing State and private forests, the forest industry and the Forest Workers' Union. The Chairman of the Commission has since 1921 been the Institute director.
2–3. The Institute has not been formally divided into sections. Its regular staff of research scientists numbers 7 (including the Director), each with his special subjects. There are no subsidiary centres.
4. Noteworthy items of research include: the relation of climatic factors to tree development, e.g. of summer temperature to the ripening of seed and to ring width; litter and humus decomposition under varying conditions; moraine soils; factors influencing natural regeneration (chiefly of Pine and Spruce) and therefore silvicultural practice; optimum planting techniques for Spruce and organization of the work; an extensive thinning research project with Pine and Spruce; dry matter and pulp production in Spruce in relation to dimension, taper and planting space; influence of the time of felling and planting and of barking on Pine timber quality; form height and taper studies of Pine and Spruce; relative contributions of height and diameter increment to volume increment; increment % and age in Spruce; accuracy of strip surveys; financial returns of private forests.

(2) Vestlandets Forstlige Forsøksstasjon, Bergen

1. The Vestland Forest Research Station was founded in 1916 by the 4 forestry societies of Western Norway. It is subordinate to the Department of Agriculture, and works in co-operation with the Norske Skogforsøksvesen.
2–3. There are 5 main sections of research, conducted by 4 research scientists: provenance; regeneration; pathology; growth and yield; cytology and genetics.
4. The research programme includes the following items: provenance studies on native and exotic trees, the latter including *Picea engelmanni*, Sitka Spruce, Douglas Fir, *Tsuga heterophylla*, *Abies grandis*, and *A. lasiocarpa;* natural and artificial regeneration studies; cankers and dieback of Larch, and their relation to provenance and to bioclimatic factors; top necrosis of Norway Spruce; growth and yield of Scots Pine, Norway and Sitka Spruce, Douglas Fir, *Tsuga heterophylla*, and *Abies* species; spacing experiments in Norway Spruce; genetical and cytological characteristics of Birch.

(3) Norsk Treteknisk Institutt, Oslo

1. This Institute (Norwegian Institute of Wood Technology) was founded in 1949 by about 70 firms, members of Norges Trelastforbund (Norwegian Timber-Trade Association). It operates under

the auspices of, and is financially supported by, Skogbrukets og Skogindustrienes Forskningsforening (Research Society for Forestry and Forest Industries). The object of the Institute is to serve the sawmilling, woodworking and connected industries, as an information and research centre, concentrating on applied research. It is governed by a board of directors, appointed for 3 years by Norges Trelastforbunds Forskningsgruppe (Research Group of the Norwegian Timber-Trade Association). The administration of the Institute is at present housed in the University at Blindern, Oslo, and the research branch in the Skogsforsøksvesen (see (1) above) at Vollebekk.

2–3. The staff at Blindern number 4 (3 being graduates), that at Vollebekk 3, viz. 1 research scientist and 2 technicians, working under the guidance of a member of the research staff of the Skogsforsøksvesen. There are no subsidiary centres.

4. Work during 1950 included: the effect of log dimension and taper on the quantity and grade of sawn goods; the effect of floating, with and without bark, on the quality of saw timber (in co-operation with the Skogsforsøksvesen); and the use of wood waste. The programme for 1951 includes research on: the rationalization of transport within the mill; the standardization of saw blades; and variations in the moisture content of wood in use in different parts of the country (in co-operation with the Norwegian Building Research Institute).

(4) Papirindustriens Forskningsinstitutt, Skøyen

1–2. This Institute (Research Institute of the Paper Industry) is in its 29th working year. It has 5 research sections: mechanical pulp; chemical pulp; derivatives; paper and cardboard; and wallboard.

4. Research subjects during 1950 included: comparisons between Tidmarsh and other grinders; the determination of chips in mechanical pulp; the effect of water hardness on tests of mechanical pulp quality; the pulping quality of Spruce of German provenance (in co-operation with the Skogforsøksvesen); semichemical pulps and their nitration; lignin in bleached chemical pulps; production of viscose; lignin-cellulose bonds; the beating of pulp; and quality variations in hardboard.

(5) Skogindustrienes Økonomiske Institutt, Oslo

The Forest Industries' Economic Institute is housed in the same building as the journal *Norsk Skogindustri*, whose editor is also the head of the Institute.

Subjects for research include: markets and price movements; and costs and profits for the various methods of wood conversion.

Representatives from centres (1), (3), (4) and (5) above are research members of Skogbrukets og Skogindustrienes Forskningsforening (Research Society for Forestry and Forest Industries). This body, which was founded in 1948 and draws its directing members from Norges Skogeierforbund (Norwegian Forest Owners' Association) and the various wood-using industrial associations, gives financial support to these four centres.

PORTUGAL

(1) Laboratório de Biologia Florestal, Lisbon

1–2. The Laboratory of Forest Biology was founded in 1916 within the Direcção Geral dos Serviços Florestais (State Forest Service). It is divided into 3 sections: forest entomology; seed testing; botany; and employs 3 research scientists plus the director.

The scope of forest research in Portugal has recently been widened through collaboration with the Estação Agronómica Nacional and the Instituto Superior de Agronomia. The Gabinete Botânica (Botanical Section) of the latter is engaged on (1) the identification of tree species and varieties, with a view to their exploitation, and (2) the study of plant associations, with a view to drawing up a vegetation map of Portugal and planning reforestation. The Botanical Department of the Estação Agronómica Nacional has also been engaged in compiling inventories of species.

(2) Laboratório de Tecnologia Florestal, Lisbon

1–2. The Laboratory of Forest Technology, Lisbon, is also dependent on the State Forest Service. It deals with: physico-chemical properties of oleo-resins; the influence of tapping on the chemical composition of timbers; the influence of metals in resin distillation; and also has specialists working on phytopathology, soils and ecology. It employs 7 research scientists.

(3) Estação de Experimentação Florestal do Pinheiro Bravo, Marinha Grande

The Forest Experimental Station for Maritime Pine deals with resin tapping, thinning, and mensurational studies of *Pinus pinaster*.

(4) Estação de Experimentação Florestal do Sobreiro e Eucalipto, Alcobaça

1–2. The Forest Experimental Station for Cork Oak and Eucalypts has sections as follows: Cork Oak (all aspects); cellulose and paper pulp; timber technology. The research staff numbers 6, of whom 3 are studying the diseases of Chestnut.

(5) Junta de Investigações Coloniais, Belem

1–2. The Association for Colonial Research has special laboratories for the study of wood and other raw materials from the colonies. The emphasis is on wood technology, including preservation and pulping, with 5 research scientists.

SPAIN

(1) Instituto Forestal de Investigaciones y Experiencias, Madrid

1. All branches of forestry research are centralized at this Forestry Research Institute which emerged in 1929 from the reorganization of the Instituto Central de Experiencias Técnico-Forestales founded in 1907.
2. It is divided into 12 sections, viz., biology of inland waters; forest botany; genetics; forest pathology (including wood preservation); dendrology; soils; pulp and paper; torrent training; timber; plant chemistry; afforestation; resins; and employs 26 research scientists. In addition to its own programme, the Institute is required to do research for the State Services and public industrial undertakings.
4. Noteworthy items of research are: revision of the Spanish forest flora; systematic study of Spanish soils; supersession of creosote by modern, water-soluble preservatives; selective breeding of *Pinus pinaster* (projected also for *Quercus suber*); trials of new resin-tapping systems and chemical stimulation; co-operative research with the Instituto Español de Entomología on forest pests.

(2) Estación Regional de Lourizán, Pontevedra

This centre, which undertakes both teaching and research, concentrates on problems peculiar to Galicia, particularly the selective breeding of *Pinus pinaster* and *Eucalyptus globulus*, and the seed testing of *P. pinaster*.

SWEDEN

(1) Statens Skogsforskningsinstitut, Stockholm

1. The State Forest Research Institute was established in 1902 under the title Statens Skogsförsöksanstalt. It underwent appreciable expansion from 1912, a special building being erected near Stockholm, and another big reorganization and extension in 1944, when its present name was adopted. The Institute is governed by a board which also controls the Skogshögskolan (College of Forestry).
2. There are 7 main sections: forestry with 7 research scientists; forest survey with 4; work and equipment studies with 3; botany and soil science with 5; genetics with 2; zoology with 3; and mathematical statistics with 1.
4. Current research work includes: growth and yield studies, particularly in relation to pulpwood quality; seed and regeneration studies; studies of growth rings in relation to climate; machines for soil preparation; production costs of small assortments; flame photometry; drainage and afforestation of peatland; bluestain; red heart of Beech; biology of the soil flora; ecology with particular reference to the nutrient relations of plants, including studies in leaf analysis and the nutrient relations of moss cover; intraspecific crosses and provenance of Scots Pine; and a survey of *Hylotrupes* in buildings. The second State Forest Survey has been continued, and results to date worked up.

(2) Föreningen för Växtförädling av Skogsträd, Ekebo

1 & 3. This Forest Tree-Breeding Association was founded in 1936. Its affairs are in the hands of a board of 11 members, elected at a general meeting for a period of 2 years, who appoint an executive committee. There are 3 stations, the main one for South Sweden at Ekebo, Källstorp (to which the administration is attached), one for Central Sweden at Brunsberg in Värmland, and the third for North Sweden at Sundmo, Imforsmo. The Association is financed (*a*) by grants from an organization representing the Swedish Cellulose Association, the Swedish Wood-Exporters' Association, the Swedish Paper-Mills Association, the Union of Swedish Forest Owners and the State Forest Service, (*b*) by grants from other undertakings including the Swedish Match Company, and (*c*) by an annual subsidy from the Fund for Forest Research.
2. None of the stations is divided into sections. There are 4 research scientists at Ekebo, 1 at Brunsberg and 1 at Sundmo.
4. Breeding work naturally concentrates on the main indigenous species; Pine and Spruce mainly at Brunsberg and Sundmo, hardwoods at Ekebo: but foreign species, chiefly conifers, are also under

study. All the main lines of breeding research are being followed, notably: Curly Birch progeny studies; provenance of Norway Spruce and Birch; shaping seedbearers in seed orchards; crosses between Swedish and various American Birches; reconnaissance and registration of élite trees; crosses between Scots and American Pines (*P. banksiana*, *P. contorta* and *P. murrayana*) and between Norway and Black Spruce (*Picea mariana*), and inter- and intraspecific crosses in Aspens.

(3) Svenska Träforskningsinstitut, Stockholm

1. The Swedish Forest Products Research Institute in Stockholm was founded in 1942 and is financed by the Government in co-operation with the industries concerned with forest products. For matters of policy and administration, the Government and the industries meet through a special body, the Stiftelse Svensk Träforskning (Foundation for Swedish Forest Products Research). The governing board of the laboratory consists of a president and 10 members, 5 appointed by the Government and 5 by the Foundation.
2. The Institute is divided into 3 sections for fundamental research, viz. wood technology (subsections for wood structure and timber physics; preservation and finishing; glued and bent products; timber utilization), wood chemistry (subsections for organic and cellulose/lignin chemistry; cellulose purification; analysis) and paper technology (subsections for chemistry; physics; microbiology) with a staff of 32 research scientists.
3. In addition, a programme of applied research, supported by the Association of the Forest Products Industries, is carried out in adjoining industrial laboratories; that of the cellulose industry has 7 research scientists, that of paper mills has 4, those of the wood pulp and wallboard industries, 1 each, and the Graphic Arts Research Laboratory, 3. The Departments of Cellulose Chemistry and Paper Technology of the Royal Institute of Technology are also housed in the Institute's main building.
4. Recent subjects of research include saw studies (stresses and vibrations in circular saw blades; sawing accuracy in mills; merits of swage and spring-set saws; wear of cutting steel) reagents for dissolving lignin from Spruce wood; relationship between sulphidation, methylation and sulphonation of lignin.

SWITZERLAND

(1) Eidgenössische Anstalt für das forstliche Versuchswesen, Zürich (also referred to as the 'Schweizerische Anstalt. . . .')

1. The Federal Forest Research Institute was founded in 1885 (Federal decree of 27 March), mainly at the instigation of the 'Schweizerischer Forstverein'. The direction of the Institute was assigned to a professor of the Forestry School, responsible to a managing committee headed by the president of the Swiss Educational Council, and with the Chief Federal Inspector of Forests as a member. The Department of the Interior was made responsible for finance. These arrangements have continued to the present day.
2. No formal division into sections is recognized but in effect research is divided as follows: A. Soils, plant sociology, forest climatology. B. Entomology and pathology. C. Seed collection, tree breeding and rearing. D. Silviculture and yield. E. General working techniques, equipment, initial conversion and extraction. The staff includes 11 forest research scientists.
4. Current activities are based on a comprehensive programme comprising I. Soil science (especially in connexion with II, and the improvement of degraded soils). II. Plant sociology (especially of natural forest relicts and analysis of forests subjected to artificial changes). III. Forest climatology including forest influences, hydrology, microclimate, and climatic injuries. IV. Entomology, and plant pathology. V. Seed questions, nursery practice, provenance and breeding. VI. Silvicultural technique, growth and yield studies. VII. Work studies and the primary conversion of wood in the forest.

(2) Eidgenössische Materialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und Gewerbe (E.M.P.A.), Zürich

1. The Federal Materials Testing and Research Institute for Industry, Civil Engineering and Trade, was founded in 1880 but had no specialists in wood research until 1935. In 1943 a special wood subsection was set up in Section A which deals with building materials and building construction.
2. The wood section is not subdivided. It has 4 research scientists.
4. Research projects in progress at present include: The physical and mechanical properties of Swiss timbers; timber seasoning and preservation; studies bordering on the fields of biology and chemistry', conducted in collaboration with other sections and departments of the Institute.

F. R.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

0 (02). HANDBOOKS. MANUALS. TEXTBOOKS

885. MÜLLER, R. [Editor.] Taschenhandbuch der Forstwirtschaft. [**Pocket compendium of forestry.**] Verlag M. & H. Schaper, Hannover. 1949. pp. 492. [G.] Price *DM*12 [£1. 2*s*. 6*d*.]

A ready reference book for German foresters, with contributions from specialists under the headings:—administration (*Nüsslein*); German forest statistics (*R. Müller*); soil science (*W. Wittich*); climate (*R. Geiger*); silviculture (*Krahl-Urban*); Poplars and Poplar-growing (*R. Müller*); forest protection (*F. Schwerdtfeger*); felling and extraction (with chief reference to wages, work technique and accident prevention), and the harvesting and storage of tan-bark (*Gläser*); wood technology (*Krahl-Urban*); mensurational tables (*von Laer*); forest valuation (*Blume*); and hunting and shooting (*Nüsslein*).

0 (052/054). PERIODICALS

886. **Index to volumes XI–XX [of] *Forestry*.** Oxford University Press, Amen House, London, E.C.4. 1951. pp. 31. Price 10*s*.

887. ***Foreste: Periodico dell'Associazione forestale italiana*.** Associazione forestale italiana, Piazza Venezia 11, Rome. Bi-monthly. Price *Lire* 600 p.a. in Italy, *Lire* 1200 abroad; single copies *Lire* 150 and 300 respectively.

Vol. 3, No. 4, Aug. 1951 contains 32 pp. Abbreviation in *For. Abstr.: Foreste*.

888. ***Journal of Applied Chemistry, London*.** Society of Chemical Industry, London. Monthly. Price £2 p.a.

Previously the Journal of the Society of Chemical Industry; Vol. 1, No. 1, under the new title was issued in Jan. 1951. Abbreviation in *For. Abstr.: J. appl. Chem.*

0 - - 011. TERMINOLOGY. NOMENCLATURE

See Nos. 976–82, 988, 992, 1488, 1495.

0 - - 087. APPARATUS, INSTRUMENTS, MACHINERY: GENERAL

See also No. 1270.

889. **Equipment news.** *Unasylva* 5 (1), 1951 (37–40).

A new, regular feature of *Unasylva*, to consist of notes, supplied by government services and manufacturers, on new equipment for silvicultural, fire-fighting, logging, transport and conversion operations. The first instalment includes a description of the Michigan tractor for forest-fire control. This is a tractor-tanker unit developed at the Forest-Fire Experiment Station, Roscommon, Mich., U.S.A. The tanks, pump etc. can be manufactured in form ready for installation on any crawler tractor.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. SITE FACTORS: CLIMATE, SITUATION, SOIL, HYDROLOGY (WATER AND SOIL CONSERVATION)

890. GUTSCHICK, V. Forstliche Standortskunde als Grundlage für den praktischen Waldbau. [**The science of forest sites as a basis for practical silviculture.**] Verlag M. & H. Schaper, Hannover. 1950. pp. 259. 87 refs. [G.]

Intended as a practical summary of present knowledge of the inter-relationships between site factors and forest vegetation, with special reference to tree species and natural conditions found in Germany. The main sections deal with: climatic factors (pp. 13–73); soil science (pp. 74–173); situation—altitude, gradient and aspect etc. (pp. 174–85); and the relationships between living organisms and forest sites (pp. 186–250). The last section has chapters on the relationships between tree species and site factors, dealing individually with some 8 coniferous and 16 broadleaved species; species of the ground flora as site indicators; relationships between plant communities and the site; soil organisms; injurious organisms; and the activities of man. There is a subject index and an index of authors cited.

111. *The Atmosphere. Meteorology. Climate and Microclimate*

111.8. Climatology. Climate and Microclimate

See also Nos. 885, 890, 1019, 1022, 1029, 1067, 1078–9, 1129

891. PHILIPPIS, A. DE. **Forest ecology and phytoclimatology.** *Unasylva* 5 (1), 1951 (10–4).

A review [without exact citations] of studies on isoclimes or phytoclimatic zones, and phytoclimatic classification of vegetation.

892. MACDONALD, J. **Climatic limitations in British forestry.** *Quart. J. For.* 45 (3), 1951 (161–8). 10 refs.

Gives examples from experience in Great Britain, of the limiting effects of climate by: (1) restricting the number of species that can be used, (2) limiting the range of a particular species, (3) affecting the

establishment or regeneration of tree species, (4) imposing limits on the growth of forest irrespective of species. Based on a paper read to the British Association in 1950.

113. *Situation. Gradient and Aspect. Topography*

See Nos. 890, 896, 1022, 1433.

114. *Soil. Soil Science*

See also Nos. 885, 890.

393. **Bibliography of soil science, fertilizers and general agronomy, 1947–1950.** Commonwealth Bureau of Soil Science, Harpenden. 1951. pp. xviii + 535. Price £1. 15*s*. 0*d*.

114.1. Soil Physics

394. POLEDICA, D. Pedološki mlin. **[A pedological mill.]** Pp. 14–20 in *Tehničke i Laboratoriske Novosti Instituta*, Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1949. [Serb.russ.]

An improved porcelain-ball mill for the grinding of soil.

395. MORALES CHOFRÉ, E. Análisis de suelos forestales españoles. **[The analysis of Spanish forest soils.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 22 (55), 1951 (5–83 + gph). [Span.span.f.e.g.]

Presents the results of physical and chemical analyses of 77 forest soil samples from Valencia, and of 185 samples of forest soils from other provinces of Spain. Methods and equipment for such analyses are discussed and a new pipette with a valve, designed by the author for use in the mechanical analysis of soils, is described.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 903, 1025–9, 1785.

396. BACH, R. Die Standorte jurassischer Buchenwaldgesellschaften mit besonderer Berücksichtigung der Böden (Humuskarbonatböden und Rendzinen). **[The sites of Beech forest communities in the Jura, with special reference to soils (humus-carbonate soils and rendzinas).]** *Repr.* from *Berichte der Schweizerischen Botanischen Gesellschaft, Bern* 60. 1950 (51–152). 77 refs. [G.g.]

Extensive field studies show that the site factors of decisive importance for the communities investigated (—associations and sub-associations of Braun Blanquet's *Fagion*—are local climate, soil climate and relative stability of the soil (presence or absence of erosion and deposition). Exact analysis of these factors would need further long-term research: they are the resultants of many individual factors, some of which vary independently and are interchangeable as regards their effects. The individual sites of a plant community are therefore not identical, but analogous, i.e. equivalent in total effect. The soils associated with a given community are found to be the more varied, the nearer the community to the climax. When taken together with the other site factors, however, the soils of a given community are in most cases clearly distinguishable from those of another community. The individual sites, and especially the soils, are described in detail, with many profile diagrams. In general, leaching (removal of carbonates) increases with increasing altitude, owing to the higher precipitation. Hence, also, soils on windward slopes are more leached than soils on the lee. In many places, however, this process is retarded by removal or deposition of soil material, according to relief. For the same reason the influence of parent rock on mechanical composition of the soil, is often masked. Properties of individual soil profiles cannot be explained unless all the factors—parent rock, climate, relief, time, and vegetation—are taken into account. The soils belong systematically to the humus carbonates and rendzinas of Pallmann, and in a few exceptional cases to the brown earths or transitions to these.

897. EHRHARDT, F., and KLÖCK, W. Die waldbauliche Auswertung pflanzensoziologischer und bodenkundlicher Untersuchungen auf Buntsandstein (Forstamt Mittelsinn, Nordspessart). **[The value for silvicultural purposes of ecological and pedological investigations on new red sandstone (forest district of Mittelsinn, Nordspessart).]** *Forstwiss. Cbl.* 70 (5), 1951 (267–309). 7 refs. [G.]

A detailed study was made of the vegetation associations and the soils of this district with the objects of defining the individual sites, investigating the development of the natural forest and the properties and stability of the soils, studying the influence of human intervention, and estimating the value of such data in drawing up forest management plans. The detailed results of the study are presented, and include a vegetation map of the district. Brief recommendations are given for the treatment of forest on each soil type.

898. DIMBLEBY, G. W. **Ecological studies on *Calluna* heaths.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (119–20).

Cf. *For. Abstr.* 12 (No. 2636).

114.4. Soil Classification. Soil Types

See also Nos. 896–7, 1067

899. KELLOG, C. E., and NYGARD, I. J. **Exploratory study of the principal soil groups of Alaska.** *Agric. Monogr. U.S. Dep. Agric.* No. 7, 1951. pp. 138 + map + tbl. 29 refs.

The definition, classification, and distribution of the principal soil groups in Alaska are suggested. Tundra and podzol are regarded as the principal zonal soils, though the area of well developed podzols is small. A new intrazonal soil group—the subarctic brown forest soils—is described.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion.

See also Nos. 890, 896–7, 1124, 1175, 1431–4.

900. **[The chemical content of leaves in relation to site fertility.]** *Rep. Cent. St. For. Exp. Sta., 1950* [1951] (27–8).

[Cf. *For. Abstr.* 13 (Nos. 1433–4).] Leaf samples collected by a standardized method from various tree species growing on a wide variety of sites were analysed for N and other nutrient elements. In one

study, samples were taken from trees on plots established in even-aged White Oak stands on 33 different sites in Southeastern Ohio. A highly significant correlation was found between the N content of the leaves and the site index. On the poorest sites, the N content averaged less than 1·8%, and on the better sites rather more than 2%, ranging up to 2·57%. Internal (leaf) N concentrations of 2·7% and over are considered necessary for maximum growth of White Oak. The N content of the leaves showed a significant correlation with the depth of the A_1 soil horizon but was not significantly related to the age of the trees. No relationship was found between the P content of White Oak leaves and growth. In all studies in which hardwood seedlings were planted in mixtures with Black Locust, growth and the N content of the leaves of the other species were significantly greater than in the same species planted without Black Locust. [Cf. *For. Abstr.* 13 (No. 1194).]

114.6. Soil Biology

See also Nos. 1142–3, 1329, 1366.

901. HOPF, M. Untersuchungen über die natürliche Mikroflora des Bodens. **[Research on the natural microflora of the soil.]** *Archiv für Mikrobiologie, Berlin* 14 (4), 1950 (661–77). [G.g.] O.R.S.

The microflora in the soil under a stand of *Juniperus communis* was compared with that in field and garden soil. Results are shown in tables and graphs.

902. KÜHNELT, W. Ein Beitrag zur Kenntnis der Bodentierwelt einiger Waldtypen Kärntens. **[The soil fauna of some Carinthian forest types.]** *Repr.* from *Mitteilungen des Naturwissenschaftlichen Vereines für Kärnten, Klagenfurt* 137–8, 1948 (165–73). [G.] X.

903. DRIFT, J. VAN DER. **Analysis of the animal community in a Beech forest floor.** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 9, 1951. pp. 168 + 1 photo, 3 tbls. Many refs. [E.e.] (*Repr.* from *Tijdschrift voor Entomologie* 94 (1), 1951.)

The conception of soil fauna is discussed, literature on the subject is surveyed, and methods for quantitative determination of the fauna present are described. The area studied was a Beech forest without undergrowth, on poor sandy soil. The results showing horizontal and vertical dispersal and seasonal fluctuations of macro- and mesofauna are discussed and tabulated, and the average composition of the forest-floor community is given in graphs, expressed in terms of population density (numbers/40 c.c.) and of population volume ($\frac{1}{1000}$ cu.mm/40 c.c.). Literature on the breakdown of litter by soil fauna is summarized. Results of laboratory experiments on the consumption of Oak litter by *Glomeris marginata* and of Beech litter by *Cylindrojulus silvarum* are tabulated and discussed. [Cf. *For. Abstr.* 12 (No. 2620).]

904. EVANS, G. O. **Investigations on the fauna of forest humus layers.** *Rep. For. Res. For. Comm., Lond. 1949/50,* 1951 (110–3). [Rothamsted Experimental Station.]

Techniques for extracting mites and other mesofauna were investigated, and ecological studies were made of the occurrence of these creatures in 6 forest sites covering both broadleaved and coniferous types. The numbers in Beech and Oak forest were larger (300–400) per sq. yd., than in conifers on various soils (160–300). Oribatid mites were the dominant form on all 6 sites.

905. MURPHY, P. W. **Soil faunal investigations.** *Rep. For. Res. For. Comm., Lond. 1949/50,* 1951 (113–6).

Work continued on the heathland soils at Allerston Forest, Yorks [cf. *For. Abstr.* 12 (No. 932)]. Quantitative assessments of mites and other arthropods in the soil were made. Absolute numbers were much lower on these peaty soils than in ordinary forest soils, and Trombididae were dominant on unafforested soils. Under forest growth on similar soils, a richer fauna, dominated by oribatid mites was found.

116. *Hydrology. Soil and Water Conservation and Erosion*

See also Nos. 1026, 1029, 1105, 1185–7, 1190–1, 1223, 1293, 1299, 1315, 1769–70.

906. GRIFFITH, A. L. **Watershed management research in the U.S.A.** *E. Afr. agric. J.* 16 (4), 1951 (190–7).

Notes on a tour in the U.S.A., Sept.–Nov. 1950.

907. HURSH, C. R. **Research in forest streamflow relations.** *Unasylva* 5 (1), 1951 (2–9).

A general account of the problems and methods involved, with special reference to the Coweeta Hydrologic Laboratory, N.C., for which salient results to date are reported.

908. FRIEDRICH, C. A. **Suggestions for manufacture and operation of a six-inch infiltrometer ring.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 104, 1951. pp. 3. 1 ref.

909. HUECK, K. Eine biologische Methode zum Messen der erodierenden Tätigkeit des Windes und des Wassers. **[A biological method of measuring erosion from wind and water.]** *Berichte der Deutschen Botanischen Gesellschaft, Berlin-Dahlem* 64 (2/3), 1951 (53–6). [G.] O.B.D.

Erosion-resistant shrubs such as *Larrea cuneifolia, Bulnesia retamo, Cassia aphylla* and *Tricomaria usillo,* growing in the shrub steppe of Catamarca province, Argentina, are capable of extending their root system downwards as it is laid bare by erosion. The level of the original beginnings of the root system, coupled with an estimate of the age of the shrub, particularly in the case of *L. cuneifolia,* can be a reliable indicator of the amount of erosion that has taken place during its lifetime. [Cf. *For. Abstr.* 11 (No. 55).]

910. MILOŠEVIĆ-BREVINAC, M. Od seoskih puteva do vododerina. **[From rural roads to gullies.]** *Šum. List* 73 (8/9), 1949 (291–301). [Croat.]

An illustrated description of the process whereby country roads are turned into gullies. The main cause of this deterioration is the prevailing mode of transport by dragging (summer sledges, and various

kinds of log skidding, mostly without the use of wheeled carriages).

911. MAHER, C. **Soil conservation in Kenya Colony. Pt. II. Soil conservation in practice: organization and legislation: present position and outlook.** *Emp. J. exp. Agric.* 18 (72), 1950 (233–48 + 8 photos). 2 refs. O.R.E.

Includes some notes on the influence of Wattle (*Acacia mollissima* var. *utilissima*) cultivation on erosion. Danger arises from periodic burning to obtain germination of the hard seed lying on the ground [cf. *For. Abstr.* 13 (No. 1124)] and subsequent regeneration of the plantations, after the bark has been stripped and the trees felled. The author recommends research on the possibility of obtaining regeneration from coppice. Meanwhile he advises, (1) the creation of diversion ditches, (2) the planting of trees in rows as near the contour as possible, and (3) the creation of short diversion banks on ploughed firebreaks where the breaks occur on erodible slopes.

14. SYSTEMATIC ZOOLOGY

See also No. 1650.

145.7. Insecta. Entomology

See also Nos. 1355 *et seq.*, 1652 *et seq.*

912. ŠLANDER, J. Entomološki zaboj. **[An entomological cage.]** *Les, Ljubljana* 1 (1/2), 1949 (23–8). 12 refs. [Sloven.]

Describes and illustrates an inexpensive apparatus invented by the author, by means of which, it is claimed, it is possible to establish, determine, or follow the following facts or phenomena: the beginning and duration of the swarming of barkbeetles; their growth in numbers, its culmination, and decline; the dependence of swarming on various climatic factors; the moment when the fertilized females fly out again following the regenerative feeding; the number of generations; the number and species of barkbeetle parasites, and the intensity of their activity. The apparatus is essentially a wooden box [e.g. 120 × 50 × 40 cm.], with a removable lid. The medial length (⅓ of the width) of both lid and bottom is made from fine gauze so as to admit air and rain; in order to exclude light the lid is covered with twigs. The box has transverse laths across the bottom, thus admitting air from below. Into holes at regular intervals in all 4 side walls are fitted empty glass bulbs (e.g. discarded electric bulbs) with their open ends admitting to the interior. The infested material is put into the box, which is then placed in the open. Smaller boxes of this sort can be used for laboratory research and bottomless boxes for observing, e.g. parasitic wasps that hibernate in the soil.

913. KANGAS, E. Die Primärität und Sekundärität als Eigenschaften der Schädlinge. **[The primary and secondary status as characteristics of [insect] pests.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (792–8). 9 refs. [G.e.] O.H.

Discusses the factors that determine whether healthy, dead or injured trees are attacked.

914. CLARK, L. R. **Habitats and communities of the Acrididae of the Trangie district, N.S.W.** *Bull. Commonw. sci. industr. Organ. Aust.* No. 250, 1949. pp. 20 + 5 photos. 10 refs.

Cf. *For. Abstr.* 11 (No. 1710).

915. COATON, W. G. H. ***Cryptotermes* of the Union of South Africa. (With key to the South Africa wood-inhabiting termites).** *Repr.* from *Journal of the Entomological Society of Southern Africa, Pretoria* 13, 1950 (1–32). 17 refs. P.R.

Describes 4 species: *Cryptotermes merwei*, *C. havilandi*, *C. brevis*, and *C. naudei*. The key is for both the imago and soldier forms.

916. HILLE RIS LAMBERS, D. De overwintering van de perzikbladluis (*Myzus persicae* Sulzer) als ei. **[The overwintering of *M. persicae* in the form of eggs.]** *Tijdschr. PlZiekt.* 57 (4), 1951 (128–9). 1 ref. [Du.e.] E.M.B.

Prunus serotina has been found to serve as the winter host to *M. persicae*. As *P. serotina* has been extensively planted in forestry as a soil improver, and as it is being spread by birds, it may constitute a serious threat to agriculture and horticulture. Eggs of *Phorodon humuli* were also found on *P. serotina*.

917. BALACHOWSKY, A. Les *Kermes* (Hom. Coccoidea) des chênes en Europe et dans le bassin méditerranéen. **[*Kermes* on Oaks in Europe and in the Mediterranean basin.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (739–54). 34 refs. [F.] O.H.

Describes 5 species, with a key for their identification, and gives details of their occurrence on different Oak species.

918. GRÖNVALL, J. S. Beiträge zur Kenntnis der Verbreitung und Biologie von *Cossus terebra*. **[Notes on the distribution [especially in Finland] and the biology of *C. terebra*.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (781–4). [G.] O.H.

919. MACKAY, M. R. **Species of *Eupithecia* reared in the forest insect survey in British Columbia (Lepidoptera: Geometridae).** *Repr.* from *Canad. Ent.* 83 (4), 1951 (77–91). 4 refs. (*Contr. Div. Ent. Dep. Agric. Can.* No. 2760.)

920. PALM, T. Die Holz- und Rinden-Käfer der nordschwedischen Laubbäume. **[Beetles found in the wood and bark of broadleaved trees in N. Sweden.]** *Medd. Skogsforsknlnst., Stockh.* 40 (2), 1951. pp. 242. 58 refs. [G.sw.]

This account, based on biological and ecological field studies in 1944–9, covers the injurious, useful, and indifferent species, found in standing trees, felled timber and stumps. Part I (pp. 8–141) deals from a general point of view with the region, material and methods of study, composition of the beetle fauna, frequency and distribution of the species, host relations, nutrition and development, gallery patterns and other diagnostic features of attack in wood, importance of the species to forestry and influence of forestry measures upon beetle attack, and examples of biocoenoses and successions in the material studied. It concludes with tables listing data, where available, for each species, indicating: (*a*) region and tree species concerned; (*b*) locality factors, whether found in standing trees, felled

timber or stumps, part of tree inhabited and its diameter, exact habitat of beetle, and health of tree; and (*c*) food, importance to forestry, life stages and frequency. Part II (pp. 142–241) is arranged systematically by families (though the treatment is not taxonomic) and gives, for each species, details of any new information resulting from the studies, with brief notes or references to literature for what was already known. There are numerous photographs, and an index to genera.

921. BROWN, W. J. **The American species of *Phratara* Chev. (Coleoptera: Chrysomelidae).** *Canad. Ent.* 83 (5), 1951 (121–30). 19 refs. (*Contr. Div. Ent. Dep. Agric. Can.* No. 2791.) O.R.S.

Five species and 3 subspecies are recognized, all of which feed on Willow or Poplar.

922. RYLE, G. B. ***Ips typographus* L. and *Ips sexdentatus* Boern. (Col., Scolytidae) with a note on *Gastropacha pini* Ochsch. (Lep., Lasiocampidae).** *Ent. mon. Mag.* 87 (1045), 1951 (179).

Suggests that the chief source of the importation of *I. sexdentatus* into the U.K. after the 1939–45 war was the Landes of France, where the forests had been badly burnt during the occupation.

923. KAMP, J. Beobachtungen über die Biologie des Eichensplintkäfers, *Scolytus intricatus* Rtzb. **[Notes on the biology of the Oak barkbeetle *S. intricatus*.]** *Anz. Schädlingsk.* 24 (6), 1951 (85). 7 refs. [G.]

924. GÖSSWALD, K. Zur Biologie, Ökologie und Morphologie einer neuen Varietät der kleinen roten Waldameise: *Formica minor pratensoides*. **[The biology, ecology and morphology of a new variety of red ant, *F. minor pratensoides*.]** *Z. angew. Ent.* 32 (3), 1951 (433–57). 7 refs. [G.g.]

925. PARAMONOV, S. J. **Review of Australian Mydaidae (Diptera).** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 255, 1950. pp. 32. 17 refs.

926. CARSON, H. L., and STALKER, H. D. **Natural breeding sites for some wild species of *Drosophila* in the eastern United States.** *Ecology* 32 (2), 1951 (317–30). 14 refs.

D. robusta was found to breed abundantly on infected sap exudates, or 'slime fluxes', of 13 species of deciduous trees. From some fluxes other spp. of *Drosophila* were also reared.

15. ANIMAL ECOLOGY (INCLUDING GAME AND FISH MANAGEMENT, HUNTING, SHOOTING AND FISHING)

See also Nos. 885, 1349–54, 1364, 1367–8, 1785, 1789.

927. **Animals and forestry.** *Nature, Lond.* 168 (4272), 1951 (449–51).

Résumé of British Association symposium, mainly on the mutual influence of the native fauna and the new plantations in Great Britain.

928. LACK, D. **Ornithological investigations in forests.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (125–6). [Edward Grey Ornithological Institute, Oxford.]

Studies were continued on the nesting of titmice. Marked increases were obtained in the second year, in the occupation of nesting boxes. In two Pine areas, where nesting rates were good, there was an abnormal 50% mortality among blue and great tits, due to starvation in the nest.

929. WODZICKI, K. A. **Introduced mammals of New Zealand—an ecological and economic survey.** *Bull. Dep. Sci. industr. Res. N.Z.* No. 98, 1950. pp. x + 255 + 1 tbl. + 14 plates. Numerous refs. B.A.P.

A comprehensive survey of the introduction and present distribution of a large number of species (many of which are important forest pests), including notes on damage to vegetation and on control measures.

930. MOHLER, L. L., WAMPOLE, J. H., and FICHTER, E. **Mule deer in Nebraska national forest.** *J. Wildlife Mgmt.* 15 (2), 1951 (129–57 + 2 plates). 16 refs. B.A.P.

Presents herd data on *Odocoileus hemionus hemionus* obtained before, during and after a deer hunt in December 1945, with some data on feeding habits taken from field observations, stomach analyses and studies on 12 browse plots. Winter movements of the deer into the more heavily wooded areas are accompanied by relatively heavy browsing, particularly of *Symphoricarpos occidentalis* and *Juniperus* sp. Small stands of Willow were heavily browsed during early spring. *Ceanothus ovatus* is probably the most important shrub for summer use. Autumn and winter browsing of *S. occidentalis* bears almost exclusively on the new growth

931. BORELL, A. E. **Russian-Olive [*Elaeagnus angustifolia*] for wildlife and good land use [on farms in the Western United States].** *Leafl. U.S. Dep. Agric.* No. 292, 1951. pp. 8.

932. GORBAČEV, V. M. Baza prudovogo hozjaĭstva **[The basis of pond management.]** *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 16 (4), 1951 (20–4). 2 refs. [Russ.] A.P.B.

Includes suggestions on suitable woody species, viz. *Quercus* [*robur* s.l.?], *Morus nigra*, *M. alba*, *Robinia pseudoacacia*, and *Caragana arborescens*, for growing on the raised banks of fish and duck ponds in Russia as food sources and cover.

16. GENERAL BOTANY

160. *Plant Chemistry*

See also Nos. 900, 942, 1025, 1246, 1321, 1524 *et seq.*, 1719–22, 1726, 1728–41.

933. **Trace elements in plant physiology.** Chronica Botanica Co., Waltham, Mass. 1950. pp. 144 + 18 photos. Price £1. 18*s*.

A symposium organized by the International Union of Biological Sciences at Rothamsted, 5–6 Nov., 1947.

934. MAYER, A. M., and GORHAM, E. **The iron and manganese content of plants present in the natural vegetation of the English Lake District.** *Ann. Bot.* 15 (58), 1951 (247–63). 14 refs. O.R.E.

935. BADGER, G. M., and BEECHAM, A. F. **Isolation of tetrahydroharman from *Petalostyles***

labicheoides. *Nature, Lond.* 168 (4273), 1951 (517–8). 7 refs.

This alkaloid has also recently been isolated from *Elaeagnus angustifolia*.

161. *Physiology*

See also Nos. 1024–5, 1033–4, 1048–9, 1051, 1208, 1287.

936. BREAZEALE, E. L., MCGEORGE, W. T., and BREAZEALE, J. F. **Nutrition of plants considered as an electrical phenomenon—a new approach.** *Soil Sci.* 71 (5), 1951 (371–5). 4 refs.

Tomato and Eucalyptus seedlings were placed in tins containing washed quartz sand and various nutrient solutions. When the negative pole of a Fisher electropode was connected with the plant, and the positive to the container, the cation uptake at the potential of specific ions was greatly increased.

937. CHEN, S. L. **Simultaneous movement of P^{32} and C^{14} in opposite directions in phloem tissue.** *Amer. J. Bot.* 38 (3), 1951 (203–11). 33 refs. O.B.D.

Experiments with Willow and Geranium proved that P^{32} and C^{14} move simultaneously in opposite directions in the phloem tissue.

938. MORELAND, D. E. **A study of the translocation of radioactive phosphorus in Loblolly Pine (*Pinus taeda* L.).** *J. Elisha Mitchell sci. Soc.* 66 (2), 1950 (175–81). 17 refs. L.S.

A study was made of the rates and paths of mineral-salt movement in *Pinus taeda*, using radioactive phosphorus P^{32} as a tracer. Rootlet tips were immersed in vials containing the phosphorus for periods up to 10 hr. The rootlet was then severed and the tree felled. Cross-sectional root and stem samples were taken and analysed. The results are tabulated. The highest translocation rate obtained for P^{32} in the lateral roots was 1·42 m. per hr. The maximum determined rate for combined stem and root movement was 1·20 m. per hr. There were indications that movement is faster in the lateral roots than in the stem. [Cf. *For. Abstr.* 12 (No. 59).]

939. STRUGGER, S., and BAUMEISTER, W. Zur Anwendung des Ultrarotabsorptionsschreibers für CO_2-Assimilationsmessungen im Laboratorium. **[The use of the infra-red absorption recording instrument for CO_2 assimilation measurements in the laboratory.]** *Berichte der Deutschen Botanischen Gesellschaft, Berlin-Dahlem* 64 (1), 1951 (5–22). 12 refs. [G.] O.B.D.

Includes results of measurements on some tree species.

940. TRECCANI, C. P. Ricerche sulle fluttuazioni e sugli spostamenti delle riserve carboidrate e azotate delle radici e della chioma di giovani alberi di melo. **[The fluctuation and translocation of carbohydrate and nitrogen reserves in the roots and crown of young Apple trees.]** *Ann. Sper. agr.* 5 (2), 1951 (337–58). 21 refs. [It.it.e.] C.G.B.

It was shown that the accumulation of reserves in the roots of seedling (3-year-old) plants began about 40 days earlier than in the crown, and that the crown does not utilize the root reserves during the period of vegetative renewal. The % of total carbohydrates in the roots is higher than that in the crown, and of the carbohydrates studied, starch showed the widest fluctuations. In 7-year-old trees, the fluctuations in carbohydrate reserves were insignificant compared with those in juvenile (3-year-old) plants. The hydrolysis of starch in the winter and its synthesis in the spring, which take place in the crown, do not occur in the roots of Apple trees. The reserves of protein N and total N in the roots vary slightly in the course of the year and show an increase in the months preceding budding and flowering. The effect on reserves of a severe hail-storm in mid-July were also studied.

941. MORTON, A. G. **Formation of extracellular nitrogen compounds by fungi.** *Nature, Lond.* 168 (4269), 1951 (333–4). 4 refs.

Observations of a number of mould fungi showed that the assimilation of inorganic N by these organisms is normally accompanied by the conversion of a surprisingly high proportion of the N available (10–20%) into compounds that are not accumulated in the mycelium. The relation of these compounds to the process of assimilation, and whether they are to be regarded as excretion products, or as playing a more essential part, are questions still to be investigated.

162. *Pathology and Teratology*

See also Nos. 967, 1044.

942. POLOŽENCEV, P. A., and POLOŽENCEV, I. P. O prižiznennom diagnostirovanii sostojanija derevjev duba posredstvom 'infuzornoi proby'. **[The diagnosis of the condition of living Oak trees by means of the 'infusorial test'.]** *Priroda, Moskva* 40 (4), 1951 (65–6). 3 refs. [Russ.] A.P.B.

Gives some results from tests of the antibiotic effect against *Paramoecium caudatum* [method not detailed] of leaves and phloem from healthy, diseased, and dead Oak trees. Volatile antibiotic substances were detected in green and yellow, but not in dead leaves. Green leaves showed most effect and dead leaves none: no clear differences were evident as between healthy and diseased trees, nor in leaves from different parts of the crown. Sap expressed from the phloem of trees over 90 years old had a more rapid action than that from younger trees. Sap from diseased trees was more effective than that from healthy ones, and sap from the vicinity of an artificial wound made some days previously was more effective than that from samples taken some distance away on the same tree.

163. *Embryology*

943. MEHRA, P. N., and SIRCAR, M. K. **The structure and development of the female and male gametophytes in *Cupressus funebris*.** *Proceedings of the National Institute of Sciences of India, Delhi* 15 (1), 1949 (15–23). 16 refs. O.R.S.

944. KAEISER, M. **Embryo development of the Pond Cypress (*Taxodium ascendens* Brongn.).** *Transactions of the Illinois State Academy of Science, Springfield* 42, 1949 (63–7). 5 refs. C.G.B.

945. MITRA, J. N., and DATTA, R. M. **A note on the development of embryo-sac and endosperm in**

Alangium chinense **(Lour.) Harms.** *Bull. bot. Soc. Bengal* 3 (1), 1949 (11–5 + 7 drawings), 15 refs. O.B.D.

164. *Morphology*

See also Nos. 991, 993–4, 1033, 1043, 1136, 1488 *et seq.*

946. THODAY, D. **The haustorial system of *Viscum album*.** *J. exp. Bot.* 2 (1), 1951 (1–19 + 8 photos). 10 refs. O.B.D.

947. GIFFORD, E. M., JR. **Ontogeny of the vegetative axillary bud in *Drimys winteri* var. *chilensis*.** *Amer. J. Bot.* 38 (3), 1951 (234–43). 30 refs. O.B.D.

948. GIFFORD, E. M. JR. **Early ontogeny of the foliage leaf in *Drimys winteri* var. *chilensis*.** *Amer. J. Bot.* 38 (2), 1951 (93–105). 44 refs. O.B.D.

949. POERCK, R. A. DE. Contributions à l'étude du palmier à huile africain (*Elaeis guineensis* Jacq.). [**Contributions to the study of *E. guineensis*.**] *Oléagineux, Paris* 5 (11–12), 1950 (623–8; 689–94). 50 refs. [F.] O.R.E.

(1) Development of the gynaeceum in the flower and development of the flower into the fruit; (2) sterility in var. *pisifera*; (3) cytological study of different varieties of *Elaeis*.

950. NEAL, M. C. **Common and aberrant flowers of *Cassia fistula*.** *Pacific Science, Honolulu* 5 (1), 1951 (82–9). 11 refs. E.M.B.

951. THOMPSON, J. M. **A further contribution to our knowledge of cauliflorous plants (with special reference to *Swartzia pinnata* Willd.).** *Proc. Linn. Soc., Lond.* 162 (2), 1951 (212–22 + 19 photos). 28 refs. O.B.D.

952. KURATA, M., and NAKADAIRA, K. **Illustrations of the [leaf] hairs of trees.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 47, 1951. pp. 74. [Jap.]

Descriptions with line drawings and measurements from 115 Japanese species and varieties.

165. *Phylogeny, Evolution. Heredity, Genetics and Breeding, Variation*

See also Nos. 949, 993, 997–8, 1003, 1042, 1122–3, 1153, 1199, 1282, 1320, 1322, 1754.

953. MATTHEWS, J. D. **Forest genetics.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (40–7).

A general report on work in progress, including experiments in vegetative propagation of *Thuja plicata* and *Metasequoia glyptostroboides*.

954. PLACE, I. C. M. **A tree-breeding program for Canada.** *For. Chron.* 27 (2), 1951 (164–70). 8 refs.

955. PAULEY, S. S. **Forest-tree breeding work at the Cabot foundation.** *Arnoldia, Harvard University, Mass.* 10 (1), 1950 (1–8). L.S.

956. LINDQUIST, B. **The improvement of Birch.** *Quart. J. For.* 45 (3), 1951 (156–60 + 5 photos).

A short account of experiments in Sweden in the breeding of Birch, based on a paper read to the British Association in 1950. [Cf. *For. Abstr.* 13 (Nos. 1122–3).]

957. GUERREIRO, M. GOMES. **Sôbre o problema do melhoramento florestal do género *Populus* L.** [**The silvicultural improvement of *Populus*.**] *Publ. Serv. flor. aqüic. Portugal* 11 (1/2), 1944 (53–117 + 1 plate). 64 refs. [Port.port.e.]

A review, based on world literature, of work in the selective breeding of Poplars, with some cytological observations on 13 *Populus* species and varieties grown in Portugal. *P. balsamifera* was found to be triploid ($n = 57$), all the others being diploid ($n = 38$). A close correlation was observed between polyploidy and length of stomata in 2 varieties of the same species. The triploid tree appeared to be more vigorous than the others.

958. KANEZAWA, R. **Induced tetraploidy in Japanese Cypress (*Chamaecyparis obtusa* Endl.).** *Bull. Tokyo Univ. For.* No. 39, 1951 (21–30). 30 refs. [E.e.jap.]

Studies were made on a colchicine-induced tetraploid seedling and on normal seedlings. The chromosome numbers for the diploid were found to be $2n = 22$ and for the treated plant $2n = 44$. The following characteristics of the tetraploid were determined: (1) the number of needles per unit length of branch is greater; (2) the number of stomata per sq. mm. is $\frac{1}{4}$ that of the diploid, and their average diameter is 30% higher; (3) cell diameters are larger, and the cells are rounder in shape; and (4) wood fibres are about 30% longer and 40% thicker.

959. MUKHERJEE, S. K. **Cytological investigations on the Mango (*Mangifera indica* L.) and the allied Indian species.** *Proceedings of the National Institute of Sciences of India, Delhi* 16 (4), 1950 (287–303). 40 refs. O.R.S.

Describes an investigation on *M. sylvatica*, *M. caloneura* and *M. indica* (23 cultivated varieties and 1 wild race).

960. KUDAŠEVA, R. F. Guttonosnostj bereskleta borodavčatogo pri semennom i vegetativnom razmnoženii. [**The latex content of *Euonymus verrucosus* propagated from seed and from root cuttings.**] *Lesn. Hoz.* 1950 (5), (75–7). [Russ.]

Studies made in 1948 by the All-Union Forestry Research Institute (VNIILH) on 10-year-old plants of *E. verrucosus* raised from root cuttings taken from parents in various localities, showed that with two exceptions the latex content of a given clone was practically uniform with that of its parent. Nine-year-old seedlings, however, varied widely in latex content, though in general the mean content of the progeny of high-yielding parents exceeded that of the progeny of low yielders. Tests of 2-year-old *E. europaeus* seedlings from parents of known latex content showed the same type of variation. There are thus evidently good prospects for selective breeding and vegetative propagation of élite strains.

961. RIGHTER, F. I., and DUFFIELD, J. W. **Interspecies hybrids in Pines.** *J. Hered.* 42 (2), 1951 (75–80). 13 refs. O.R.S.

Summarizes results of a programme of species crossings in *Pinus* carried out at the Institute of Forest Genetics, California Forest and Range Experiment Station. About 230 interpollinations between species have been attempted. Of these 46,

including some inter-varietal crossings and back-crossings of hybrids, have so far yielded viable progeny. Results showing successful, unsuccessful, undetermined and untried crosses for the sections Haploxylon and Diploxylon (few intersectional crosses have been attempted, and none successfully) are tabulated.

962. ŽURBIN, A. I. Povyšenie skreščivaemosti vidov topoleĭ pri pomošči predvariteljnogo vegetativnogo sbliženija. **[Increasing the capacity of Poplar species for hybridization by previous grafting [of one parent upon a stock of the other].]** *Priroda, Moskva* 40 (4), 1951 (66). [Russ.] A.P.B.

Claims that artificial crossings (cut-branch technique) between *Populus alba* ♀ and *P. tremula* ♂, gave more seed and seedlings when the ♂ parent was a scion of *P. tremula* that had been grafted some years before on a *P. alba* stock. [Only 3 parents appear to have been used and the ♂ parents seem to be of different clones.] In all, 19 catkins were pollinated, yielding 1 seedling from the ungrafted and 16 from the grafted parent. This is viewed as an example of the successful application of Mičurin's principles.

963. CHEVALIER, A. À propos de l'*Eucalyptus coccifera* Hook f. var. *favieri* Chev. **[*E. coccifera* var. *favieri*.]** *Rev. int. Bot. appl. Agric. trop.* 31 (341/342), 1951 (234–5). [F.] P.R.

The tree in the Parc de la Fauconnière [cf. *For. Abstr.* 9 (No. 201)] continues to seed itself, giving plants of slightly differing form. It is suggested that it may be a hybrid, *E. pulchella* × *coccifera*.

964. PRYOR, L. D. **Some hybrids of *Eucalyptus viminalis*.** *Aust. For.* 14 (2), 1951 (95–8 + 3 photos). 3 refs.

Hybrids of *E. viminalis* with *E. bridgesiana*, *E. cinerea* and *E. rubida* are described. The distinctive character of the juvenile foliage of each species in comparison with that of *E. viminalis* makes the hybrid state of the suspect quickly evident when seedlings are raised. Three kinds of hybrid population are described:—(1) a segregating swarm in which all combinations are viable, (2) a segregating swarm in which most intermediate combinations are not viable, and (3) a probable polymorphic population in which the amplitude of variation is reduced. *From author's summary.*

166. *Economic Botany*

See also Nos. 1720 *et seq.*

965. CHEVALIER, A. Les plantes-poisons de l'Oubangui et du Moyen Congo. **[The plant poisons of the Ubangi and of the Middle Congo.]** *Rev. int. Bot. appl. Agric. trop.* 31 (343/344), 1951 (249–57). [F.] P.R.

Lists, with botanical descriptions and some account of the preparation of the poison, a number of trees, shrubs and lianes, including *Strophanthus* spp., *Periploca gabonica*, *Erythrophleum guineense*, *Strychnos icaja*, *Diospyros* sp. and *Teclea* sp.

966. WATT, J. M. **Some common poisonous trees and shrubs [in S. Africa].** *Trees S. Afr.* 3 (1), 1951 (2–4, 15).

168. *Histology*

See also Nos. 1488 *et seq.*

967. HERING, E. M. Veränderungen in pflanzlichen Geweben unter dem Einfluss minierender Insekten-Larven. **[Changes in plant tissue caused by the larvae of mining insects.]** *Svensk bot. Tidskr.* 45 (1), 1951 (42–71 + 9 photos). 9 refs. [G.] O.B.D.

A study was made of wound tissue caused by the action of various leaf-miners in a large number of plants, including some species of *Betula*, *Populus*, *Quercus* and *Salix*. The results are presented in detail, and the nature of the tissue changes discussed.

968. CERUTI, A. Sul processo di suberificazione nel castagno. **[The process of suberization in *Castanea sativa*.]** *Ann. Sper. agr.* (*n.s.*) 4 (6), 1950 (1023–47). 9 refs. [It.it.e.] C.G.B.

Cf. *For. Abstr.* 13 (No. 1497).

17. SYSTEMATIC BOTANY

969. MELVILLE, R. **On the application of biometrical methods in plant taxonomy.** *Proc. Linn. Soc., Lond.* 162 (2), 1951 (153–9). 8 refs. O.B.D.

172.8. Eumycetes (True Fungi)

See also Nos. 1320 *et seq.*

970. BESSEY, E. A. **Morphology and taxonomy of fungi.** Blakiston Company, Philadelphia. 1950. pp. xiii + 791. Many refs. Price $7.00. P.R.

A fundamental work. Contains a guide to the literature on the identification of fungi, divided into 51 lists and totalling *ca.* 2,000 references.

971. MATHIESEN, A. Einige neue *Ophiostoma*-Arten in Schweden. **[Some new species of *Ophiostoma* in Sweden.]** *Svensk bot. Tidskr.* 45 (1), 1951 (203–32). 25 refs. [G.e.] O.B.D.

Three *Ophiostoma* species, not previously found in Sweden, and 4 new species are described. *O. minutum* is found in Sweden on Spruce and Pine in old tunnels of various barkbeetles. *O. polonicum* causes a deep green stain on half-dry Spruce, but is not associated with any particular barkbeetle and is not very common in Sweden. *O. canum* has been constantly isolated from deeply stained sapwood of Pine, following attack by *Blastophagus minor*. It is very common in Sweden. *O. olivaceum* sp. nov., with a *Graphium* conidial stage, has been found in tunnels of *Acanthocinus aedilis* on Pine, where it produces a blue-green stain. *O. floccosum* sp. nov., with a *Graphium* conidial stage, occurs sporadically in old tunnels of various barkbeetles, and on mechanically injured stems of Pine and Spruce. It causes a slight blue stain. *O. clavatum* sp. nov. is associated with *Ips acuminatus* on Pine. It is very common in Sweden and produces a fast-developing deep blue stain. *O. tetropii*, with a small hyaline *Scopularia*-like conidial stage and fast-growing, slightly pigmented mycelium, is found in tunnels of *Tetropium* sp. on Spruce. In the timber it causes a slight blue-green stain round the tunnels. *From author's summary.*

972. AOSHIMA, K. **Wood-rotting *Poria* from Japan. (I).** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 46, 1950 (155–68). 12 refs. [Jap.e.]

An account of 6 species previously unknown in Japan.

973. Hussain, S. M. ***Fomes roseus*** **(A. & S.) Cke. in Pakistan.** *Pakistan J. For.* 1 (3), 1951 (234–7). 8 refs.

Account of the morphology and culture of this fungus, which has been observed on dead stumps of conifers in the Murree Hills and also in East Bengal, causing brown cubical rot. It has not been found producing top rot and does not cause decay in seasoned timber.

974. Hussain, S. M. ***Polyporus hispidus*** **(Bull. *ex* Fr.) and *Fomes demidoffii* (Lev.) Sacc. in Baluchistan.** *Pakistan J. For.* 1 (3), 1951 (290–1).

Description of sporophores.

975. Keener, P. D. **Mycoflora of buds. II, Results of histological studies of non-irradiated buds of certain woody plants.** *Amer. J. Bot.* 38 (2), 1951 (105–10). 9 refs. O.B.D.

Microscopic examinations of normal foliage buds of *Aesculus hippocastanum* and *Cedrela sinensis* revealed the presence of apparently non-pathogenic fungi and bacteria. The micro-organisms appeared to colonize outer bud scales more frequently than inner. Preference for tissues other than the periderm covering portions of bud scales was also noted. [Cf. *For. Abstr.* 12 (No. 2769).]

174. *Spermatophyta, Seed-Plants in General. Floras and Check-Lists*

976. Edlin, H. L. **English tree names and their origins.** *Forestry* 24 (1), 1951 (57–63). 8 refs.

977. Soljanik, I. Spisak naučnih i narodnih imena šumskog drveća i džbunja na ruskom, srpskohrvatskom i latinskom jeziku. [**List of scientific and common names of forest trees and shrubs in Russian, Serbo-Croat, and Latin.**] Institut za Naučna Istraživanja u Šumarstvu na Srbije, Belgrade. 1950. pp. 10. 12 refs. [Russ.Serb.Lat.]

A list of some 300 forest species (trees, shrubs, and other plants) intended primarily as an aid to the readers of Russian forestry literature.

978. Wyatt-Smith, J. **Vernacular tree name changes.** *Malay. Forester* 14 (2), 1951 (82–8). 3 refs.

It has been felt necessary to recommend changes in some of the preferred Malay vernacular names for dipterocarps as published in the *Foresters' Manual of Dipterocarps* [cf. *For. Abstr.* 8 (No. 953)], and the old, new, and scientific names involved are listed. The changes have been suggested in an endeavour (1) to prevent the confusion which exists between vernacular tree and timber names, (2) to bring together species closely related botanically and in type of timber, and (3) to establish a name for the tree which is descriptive of those characters used in differentiating the species in the field. [Cf. *For. Abstr.* 13 (No. 1423).]

979. Orpen, E. L. **Botanical — vernacular and vernacular—botanical names of some trees and shrubs in Matabeleland. With a foreword by E. J. Kelly Edwards.** *Rhod. agric. J.* 48 (2), 1951 (165–81). E.M.B.

980. Gossweiler, J. Flora exótica de Angola. Nomes vulgares e origem das plantas cultivadas ou sub-espontâneas. [**The exotic flora of Angola. Common names and origins of introduced or acclimatized plants.**] *Agron. angol.* Nos 1–3, 1948–50 (121–98; 173–255; 143–67). [Port.f.e.]

981. Gossweiler, J. Flora exótica de Angola. Índice dos nomes botânicos actualizados e sinonimos. [**The exotic flora of Angola. Index of valid botanical names and synonyms.**] *Agron. angol.* No. 4, 1950 (167–94). [Port.]

982. Smith, C. A. **The rule of priority in botanical nomenclature with special reference to indigenous woody species of South Africa.** *J. S. Afr. For. Ass.* No. 20, 1951 (31–50). [E.]

The following new combinations and revisions are proposed:—*Hartogia schinoides* for *H. capensis*, *Curtisia dentata* for *C. faginea*, *Helinus mystacina* for *H. ovata*, *Vepris undulata* for *V. lanceolata*, *Celtis africana* for *C. kraussiana*, *Combretum caffrum* for *C. salicifolium*, *Millettia grandis* for *M. caffra*, *Linociera foveolata* for *Olea foveolata*, *Hyaenanche globosa* for *Toxicodendron globosum*, *Ficus ilicina* for *F. gurichiana*, *Leucospermum conocarpodendron* for *L. conocarpum*, and *Virgilia oroboides* for *V. capensis*.

983. Spilhaus, M. W. **Indigenous trees of the Cape Peninsula.** Juta & Co., Ltd., Cape Town. 1950. pp. [x] + 122. 24 refs. Price 15*s*.

Short accounts of 26 species, each illustrated by a photograph of the tree and one of its flowers and fruit.

984. Loock, E. E. M. **A key to the trees and woody shrubs of the forests of the Knysna region [Cape of Good Hope].** *J. S. Afr. For. Ass* No. 20, 1951 (81–105). [E.]

Includes 73 species. The key is based on characteristics of leaves, twigs, and bark.

985. Keet, J. D. M. **Check list of trees of the Okavango native territory [S.W. Africa].** *J. S. Afr. For. Ass.* No. 20, 1951 (106 + 1 tbl.).

Cf. *For. Abstr.* 11 (No. 2464).

986. Steyermark, J. A. *et al.* **Contributions to the flora of Venezuela.** *Fieldiana* (*Bot.*) 28 (1), 1951. pp. 242.

987. Stehlé, H., Stehlé, M., and Quentin, L. Flore de la Guadeloupe et dépendances et de la Martinique. Tome II. Catalogue des phanérogames et fougères avec contribution à la flore de la Guyane française. Fasc. 3. [**The flora of Guadeloupe and its dependencies and Martinique. Vol. 2. Catalogue of the phanerogams and ferns, with a contribution on the flora of French Guiana, Fasc. 3.**] Imprimerie Clément Brunel, 18 Rue Dom-Vaissette, Montpellier. 1949. pp. 150

[Cf. *For. Abstr.* 12 (No. 149).] This fascicle contains Leguminosae (Caesalpinioideae) to Caricaceae.

988. Béna, P. Les essences forestières de la Guyane française. [**The forest tree species of French Guiana.**] *Bois For. Trop.* No. 17, 1951 (55–7). [F.]

An alphabetical list giving French, vernacular and scientific names and density of the wood, with a rough indication of frequency and size of trees.

989. MACBRIDE, J. F. **Flora of Peru.** *Bot. Ser. Field Mus. nat. Hist.* 13 (Pt. 3, No. 3), 1950 (781–999). (*Field Mus. Publ.* No. 653.)

Cf. *For. Abstr.* 11 (No. 897).

990. FRANCIS, W. D. **Australian rain-forest trees; including notes on some of the tropical rain-forests and descriptions of many tropical species.** Commonwealth Forestry and Timber Bureau, Canberra, Australia. 2nd ed., 1951. pp. xvi + 469 + map.

The previous edition (1929) did not deal with tropical species; about 80 pages of the present edition are devoted to them.

174.2. Gymnosperms

See also No. 1540.

991. JANCHEN, E. Das System der Koniferen. [**Systematics of the Coniferae.**] *Sitzungsberichte, Mathematisch-naturwissenschaftliche Klasse, Österreichische Akademie der Wissenschaften, Wien, Abteilung I* 158 (3), 1949. pp. 262. 168 refs. [G.] O.R.S.

A new arrangement, based chiefly on comparative morphology, is proposed and described.

992. MORGENTHAL, J. Die wildwachsenden und angebauten Nadelgehölze Deutschlands. [**The wild and cultivated conifers of Germany.**] Gustav Fischer, Jena. 1950. pp. 144. 7 refs. [G.] Price *DM*8.50 [16*s.* 6*d.*].

A systematic manual with keys to genera and species, and indexes of scientific and German names.

993. LAING, E. V. **Botanical studies of variation in certain conifer species.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (124). [Dept. of Forestry, Aberdeen University.]

Work has been continued on morphological variation in Scots Pine; particular importance is now attached to length of needle, breadth and thickness of needles, and relationship between pith and wood diameter of the current year's shoot. It is evident that there are several definite types of Douglas Fir marked by morphological characters. These may be tentatively enumerated as: arrangement of needles, thickness of needle, continuity of hypoderm, presence or absence of papillate cells, presence or absence of stone cells, colour of both ♀ and ♂ flowers, shape of ovuliferous scale, and length of bract scale. It may be possible to distinguish bark types. Sitka Spruce so far seems to show bark and cone differences, and often variation in stomatal development.

994. FRANCO, J. DO AMARAL. Abetos. [**Firs.**] *Repr.* from *An. Inst. Agron., Lisboa* 17, 1950. pp. vii + 260. Numerous refs. [Port.]

This study of the genus *Abies*, based on species cultivated in Portugal, is in 4 parts: (1) the genus *Abies*, its nomenclature, morphology and anatomy, (2) the taxonomic value of characters used in the classification of Firs, (3) world distribution of *Abies*, and (4) descriptions of the species cultivated in Portugal, with a key for their identification.

995. DIMITRI, M. J. El nombre botánico de la especie de *Agathis* cultivada en la Argentina. [**The botanical name of the species of *Agathis* cultivated in Argentina.**] *Rev. argent. Agron.* 17 (1), 1950 (11–3). [Span.] E.M.B.

The species of *Agathis* cultivated in Argentina, often wrongly identified as *A. australis*, is, in fact, *A. alba*. Leaf characteristics distinguishing the 2 species are noted, and a description of *A. alba* is presented.

996. LOOCK, E. E. M. **The Pines of Mexico and British Honduras: a report on a reconnaissance of Mexico and British Honduras during 1947.** *Bull. Dep. For. S. Afr.* No. 35 [1950]. pp. 244 + 4 maps. 15 refs. Price 17*s.* 6*d.*

Contains chapters on: the cultivation of Mexican and British Honduras Pines in S. Africa and silvicultural divisions of the Union; a regional description of Mexico and British Honduras; a description of the forests by physiographic divisions; forestry practice; systematics of Mexican and British Honduras Pines; and summarized positive recommendations for growing the different species in S. Africa. [Cf. *For. Abstr.* 11 (No. 1658); 13 (No. 1111).]

997. SKRJABIN, M. P. Piramidaljnaja forma sosny obyknovennoï. [**A fastigiate form of Scots Pine.**] *Priroda, Moskva* 40 (6), 1951 (49). [Russ.] A.P.B.

Records the occurrence in the Usmanski Bor, Voronezh Province, of a single fastigiate-crowned tree some 80 years old, 25 m. high and 45 cm. in d.b.h. The tree bears a fair number of cones, and seed was collected and sown in spring 1951. Narrow-crowned Pines are found in various parts of the forest; but none are as fastigiate as this tree, the habit of which is shown in a photo.

998. GUINIER, P., and POURTET, J. Les variations du *Pinus montana* Miller du Tyrol au Briançonnais. [**Variations in *P. mugo* from the Tyrol to Briançon.**] *Bull. Soc. bot. France* 98 (10), 1951 (123–7). [F.] O.B.D.

176.1. Dicotyledons

See also Nos. 963–4, 1012, 1199, 1491–2, 1725.

999. WOODSON, R. E. JR. **Studies in the Apocynaceae. VIII. An interim revision of the genus *Aspidosperma* Mart. & Zucc.** *Ann. Mo. bot. Gdn.* 38 (2), 1951 (119–206 + 8 photos). O.B.D.

1000. WYATT-SMITH, J. **Preliminary note on identification of species of Keruing (*Dipterocarpus* spp.) in log form.** *Malay. Forester* 14 (2), 1951 (96–7).

The characters used for identification are lenticel size and abundance or paucity of resin.

1001. DUVIGNEAUD, P. Le genre *Monotes* (Dipterocarpacées) dans les forêts claires du Congo méridional et des régions voisines. [**The genus *Monotes* (Dipterocarpaceae) in the open forests of the southern Congo and adjacent countries.**] *Lejeunia, Liége* 13, 1949 (39–65). 6 refs. [F.] P.R.

A review (with key), describing the following new species: *M. oxyphyllinus*, *M. schmitzii*, *M. gigantophyllus*, and *M. mutetetwa*, and some new varieties.

1002. LAMONT, I. ***Calluna vulgaris*: a review of the literature on Heather.** Pp. 57–78 in *Hill Farm Research*, H.M. Stationery Office, Edinburgh, 1951. 67 refs.

1003. GRAVES, A. H. **Key to Chestnut species with notes on some hybrids.** *Rep. Nth. Nut Growers Ass.* 1949 (95–107). C.G.B.

1004. MILJKOV, F. N. Steljuščajasja forma duba na melovyh holmah jugo-vostoka russkoi ravniny. **[A prostrate form of Oak on chalk hills in the S.E. of the Russian plain.]** *Priroda, Moskva* 40 (6), 1951 (49–50). [Russ.] A.P.B.

Very briefly describes [without illustrating] some Oaks (*Quercus robur*) of peculiar, more or less prostrate habit, found on the steppe/woodland border along the left bank of the river Ural near its confluence with the river Utva. The three most extreme examples had a stem only 20–30 cm. high, from which prostrate branches spread some 2–2·5 m. on all sides. The leaves were paler and smaller than normal for this species.

1005. DUVIGNEAUD, P. Le cas épineux des *Strychnos* à épines des formations herbeuses de l'Afrique tropicale. **[The thorny problem of the spinous *Strychnos* species in the grassland formations of tropical Africa.]** *Lejeunia, Liége* 13, 1949 (103–22). 3 refs. [F.] P.R.

Reduces most of the numerous described species to synonymy under the 5 species here recognized, and gives a systematic table of the savanna formations in which they occur.

1006. WEBSTER, G. L. **The Polynesian species of *Myoporum*.** *Pacific Science, Honolulu* 5 (1), 1951 (52–77). 23 refs. E.M.B.

1007. MASAMUNE, G. **A new species of *Helicia* [*H. rengetiensis*], from Taiwan.** *Bull. Tokyo Univ. For.* No. 39, 1951 (143–4). [Jap.Latin.]

1008. VICIOSO, C. Salicáceas de España. **[Salicaceae of Spain.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 22 (57), 1951. pp. 131. [Span.]

A botanical study of the Spanish *Populus* and *Salix* spp., with keys for their identification.

1009. ALMEIDA, J. L. FERREIRA DE. Contribuição para o conhecimento das espécies portuguesas do género *Salix*. **[A contribution to knowledge of the Portuguese species of the genus *Salix*.]** *Publ. Serv. flor. aqüic. Portugal* 11 (1/2), 1944 (119–46 + 2 photos). 14 refs. [Port.port.e.]

A morphological and taxonomic study.

1010. KOBUSKI, C. E. **Studies in the Theaceae, XXIII. The genus *Pelliciera*.** *J. Arnold Arbor.* 32 (3), 1951 (256–62).

18. PLANT ECOLOGY

See also No. 890.

181. *Mode of Life, Autecology. Silvicultural Characters of Trees*

See also Nos. 1114, 1117, 1234, 1244, 1485.

1011. BROWN, J. M. B. **Forest ecology.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (70–6).

The study of the ecology of Beech was continued [cf. *For. Abstr.* 12 (No. 984)]. Data are given for 4 of the finest Beechwoods in the country, and the conditions under which they were grown are discussed. It is clear that soil acidity alone is not a limiting factor, as good Beech can be grown on soils ranging in pH from 3·5 to 7·0.

1012. COSTANTINO, I. N. La 'lenga', estudio forestal y método de tratamiento. **[*Nothofagus pumilio*, silvicultural study and methods of treatment.]** *Revista de la Facultad de Agronomía, La Plata* 27 (Fasc. 2), 1950 (197–220). 12 refs. [Span. span.e.] A.P.B.

A botanical account of *Nothofagus pumilio*, its wood and its geographical distribution, with a particular study of the ecology of stands in the Peninsula Avellaneda, Santa Cruz. Sample plots were established in this area, and the constitution and state of health of 3 different quality classes were investigated. The possibility of improving the forests by (1) selection fellings, and (2) strip fellings is discussed.

1013. CHAPMAN, E. F. **Preliminary report on the Eucalypts found growing in Cyprus 1944.** Forest Department, Nicosia. 1951. pp. 40. 3 refs. Price 3*s*.

The following species have been identified:—*Eucalyptus acacioides, E. bosistoana, E. camaldulensis* (*rostrata*), *E. cornuta, E. crebra, E. globulus, E. gomphocephala, E. hemiphloia, E. leucoxylon, E. occidentalis, E. paniculata, E. polyanthemos, E. propinqua, E. robusta, E. saligna, E. sideroxylon, E. tereticornis*, and *E. torelliana*. Notes are given on their natural habitat and silvicultural requirements, and on their behaviour in Cyprus.

1014. VILLIERS, P. C. DE. Die Kremetartboom. **[*Adansonia digitata*.]** *J. S. Afr. For. Ass.* No. 20, 1951 (9–18 + 3 photos). 3 refs. [Afrik.afrik.]

A general account of the characteristics of the species, with data showing correlation between periods of low rainfall and shrinkage in the girth of some trees, and discussion of this phenomenon. Notes on regeneration are given, and estimates made of the age of very large trees on a basis of 72 annual rings/inch. It is suggested that a full-grown tree (30 ft. girth) must be at least 4,000 years old.

1015. FLETCHER, M. I. **Balsa—production and utilization.** *Econ. Bot.* 5 (2), 1951 (107–25). 8 refs.

A general survey of the silvicultural requirements of *Ochroma lagopus*, its distribution, the logging and milling industry in Ecuador, and the Balsa market.

1016. GOMES, R. C. V. MONTEIRO. Esboço histórico do sândalo no Timor Português. **[A brief outline of the history of Sandal wood in Portuguese Timor.]** Ministério das Colónias, Junta de Investigações Coloniais, Lisboa. 1950. pp. 31 + 5 plates. [Port.f.e.]

181.1. Distribution, Natural Range

See also Nos. 994, 1055, 1078–9.

1017. **The study of the distribution of British plants.** Botanical Society of the British Isles, Oxford. 1951. pp. 128. 28 maps. Price 10*s*.

Report of a conference dealing mainly with methods of ecological study. The papers include one by *R. Melville* on 'The topocline in *Ulmus coritana*'. [Cf. *For. Abstr.* 12 (No. 204).]

1018. HAYASHI, Y. **The natural distribution of important trees indigenous to Japan. Conifers report I.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 48, 1951. pp. 240 + 33 photos, 11 maps. [Jap.e.]

Discusses (with distribution maps) the distribution, habitat, regeneration, wood properties and uses of *Abies firma, A. homolepis, A. mariesii, A. veitchii, Larix leptolepis, Tsuga diversifolia, T. sieboldii, Cryptomeria japonica, Sciadopitys verticillata, Chamaecyparis obtusa,* and *C. pisifera.*

1019. FAUREL, L., and LAFITTE, R. Facteurs de répartition des cédraies dans les Massifs de l'Aurès et du Bélezma. **[Factors in the distribution of the Cedar forests in the Aures and Belezma ranges.]** *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord, Alger* 40 (5/6), 1949 (178–86 + 1 dgm.). [F.] L.L.

A study of climatic and geological factors responsible for the absence of *Cedrus atlantica* in parts of this region at altitudes of 1,500 m. and over, where it generally forms pure stands without competition from other species. Some of the sites above 2,000 m., where the absence of Cedar forest has been noted, consist of hard limestone ridges with marly limestone slopes. On other sites, where the geological formation is favourable, absence of the forest is thought to be due to the effects of rain shadow.

1020. FUKAREK, P. Staništa Pančićeve omorike nakon šumskih požara u 1946/47 godini. **[Stands of *Picea omorika* after the forest fires of 1946–7.]** *Šum. List* 75 (1/2), 1951 (61–75). 11 refs. [Croat.g.]

Only some 30, mainly small, stands and natural groups of *P. omorika* now survive in Jugoslavia, i.e. in the area that is looked on as the primordial home of this species. With only one exception, these stands face gradual destruction. The author advocates protective measures in Bosnia similar to those taken in Serbia.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 1034, 1282.

1021. GUENTHER, K. W. **An investigation of the tolerance of White Ash reproduction.** *Abstr. of thesis,* in *J. For.* 49 (8), 1951 (576–7).

Fraxinus americana reproduction was found to be more tolerant of shade than was supposed, but release cuttings are necessary before it is 10 years old, if it is to survive.

1022. **Micro-environment significant to tree-growth in limestone region.** *Carib. For.* 12 (1), 1951 (7–8, 24–5). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11 [1950?].)

Measurements taken in the Cambalache Experimental Forest on the limestone hills of the north coast of Puerto Rico show that average growth was nearly twice as rapid on the west-facing slope (leeward) as on the east slope (windward), presumably owing to the greater evaporation on the latter. Measurements of *Coccolobis laurifolia* in 4 distinct topographic positions also illustrate the greater productivity of the lower slopes, especially on the west aspect. Of the 15 most prominent species in this area, considering only co-dominants of less than 8 in. d.b.h., *Bursera simaruba, Andira jamaicensis* and *Cecropia peltata* were growing at a rate significantly slower than the mean.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 909, 1011, 1105, 1143, 1208, 1218, 1287, 1366, 1785, 1789.

1023. GUPTA, R. S. **The soils of the Casuarina plantations with special reference to the cause of casualties (wholesale and in patches) in some of the areas.** *Indian For.* 77 (8), 1951 (479–99 + 5 photos).

The paper is based on observations made in plantations in Madras and Orissa. It was found that many cases of mortality or poor, stunted growth were due to excessive or deficient soil moisture depending on the level of the watertable and the soil profile. In sandy soils the most suitable profile for the growth of *Casuarina* is a moisture-retentive layer of soil, of closer texture than sand, immediately above the watertable, with a sandy layer on top. Where this profile is reversed, on sites with a low watertable, there is inadequate ascent of moisture, leading to soil drought and casualties in the plantations. The same condition may occur when the subsoil is a very coarse-grained sand.

For the healthy development of root nodules, the top layer of soil (nearly 2ft.) must not become too dry. The usual success of coastal strip planting is probably due to the fact that this layer is always kept moist by sea-spray. Soil pH appears not to have much correlation with growth or health of *Casuarina.* It is noted that *Casuarina* will tolerate highly alkaline soils (pH as high as 9·0 to 9·5).

1024. LEYTON, L. **Nutrient uptake of conifers.** *Rep. For. Res. For. Comm., Lond. 1949/50,* 1951 (118–9). [Imperial Forestry Institute, Oxford.]

Work was continued on the nutrient status of Sitka Spruce, Scots Pine, and Corsican Pine, growing in heathland sites in the presence, and in the absence, of *Calluna* [cf. *For. Abstr.* 12 (No. 2632)]. The effect of pH on the growth of Sitka Spruce seedlings was investigated in water cultures. In one series N was supplied as NH_4, in the other as NO_3, each series being otherwise identical in supply of nutrients. Maximum growth was obtained between pH4 and pH5, the NO_3 seedlings showing slightly better growth than the NH_4 seedlings. At extreme pH values (3 & 7) growth was markedly reduced, with pronounced abnormalities in root growth developing in the most acid solutions.

1025. CARLES, J. **Le métabolisme du calcium chez le châtaignier. [The calcium metabolism of Chestnut.]** *C.R. Acad. Sci, Paris* 232 (14), 1951 (1370–2). [F.] O.R.S.

Results of the analysis of the outer and inner bark and outer and inner wood of small branches of Chestnut from calcareous, granitic and basaltic soils are tabulated. The ash content of the bark and

wood is very much higher on calcareous and lower on basaltic soils than on the granite, and is considerably higher for the bark than for the wood, especially on the chalk soil. The same is true of the CaO content of the bark, but its variation in woods from the different soils is slight. The contents of K_2O and P_2O_5 are fairly constant for all soils, with no great difference between bark and wood.

1026. Ovington, J. D. **Ecological studies in Pine plantations.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (121–4). [Macaulay Institute for Soil Research, Aberdeen.]

Further report on changes in the Culbin sands after afforestation with Corsican Pine [cf. *For. Abstr.* 12 (No. 2925)]. One effect of afforestation is to lower the water table and bring about a redistribution of nutrients.

1027. Puri, G. S. **The ecology of the humus layer in some English forests.** *Indian For.* 76 (10; 11), 1950 (418–27; 453–66). 33 refs.

A study of humus in mixed Beechwoods in the Chilterns. Stand composition appeared to have greater influence than topography on the formation and character of the humus layer. Trees with high lime requirements and litter of a low C/N ratio tend to increase soil fertility by absorbing minerals from deeper layers and returning them to the forest floor; Ash, Hazel, Lime, Elm and, to a less degree, Sycamore, belong to this category. Trees with low lime requirements and litter of a high C/N ratio, such as Pine, Birch, Chestnut, Beech and Hornbeam, are ineffective against loss of minerals through leaching, their litter is poor in bases and decomposes slowly, and the result is unproductive conditions and mor soils.

1028. Rennie, P. J. **Research into the physical and chemical properties of forest soils.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (116–8). [Imperial Forestry Institute, Oxford.]

A preliminary trial of the litter horizon of 3 sites at Wykeham Low Moor indicated that ammonification was greater under Birch than under Sitka Spruce, but considerably greater under both than under *Calluna vulgaris*. Nitrification was so small as to require further study.

1029. Saharov, M. I., and Saharova, N. M. O vlijanii eli na počvu v lesu. [**The influence of Spruce on the soil in the forest.**] *Počvoved.* 1951 (6), (329–37). 10 refs. [Russ.russ.] A.P.B.

Gives a condensed account of the authors' studies, mostly in 1947–9 [locality not specified]. Conditions under Spruce in mixture (as single scattered dominants, understorey, and advance growth) with other species (Scots Pine, Birch, Aspen, Oak) are compared with those under the latter species in the same stands. Data are tabulated for:—air and soil temperatures; snow, litter and frost depth; snow depth, density and water content; underwood, herbaceous cover, moss layer, and litter weight/ha. The chief conclusions are that:—(1) The microclimate under Spruce is characterized by a lower degree of warming in the insolation period and of cooling in the radiation period; the lower air and soil temperatures lead to reduced evaporation, but the high interception by the crown of precipitation—especially snow—results in a reduction of soil moisture as compared with the other species. (2) The heavy shade and generally unfavourable microclimate, combined with the copious needle litter, greatly reduce the underwood, herbaceous and moss layers. (3) The litter layer, consisting for the most part of Spruce needles, has a total weight/ha. 1½–2 times that of the litter under other species, and the weight of the half-decomposed fraction is also very high. It is permeated with densely interwoven hyphae and is much compacted. (4) The extent of the differences produced by Spruce depends largely on the crown cover and the height of the base of the living crown; they are naturally less marked when the crown is small and the living crown is high above the ground. On good moist sites they are also much less marked than on poorer, drier ones. (5) On felled areas where individual trees or groups of Spruce have been left, a ground cover of forest species is found under and around the Spruce. The same factors which cause suppression of these species under Spruce in the forest, operate here to their advantage in competition with grasses and weeds of open ground. [Cf. *For. Abstr.* 13 (No. 26).]

1030. Rawlings, G. B. **The mycorrhizas of trees in New Zealand forests.** *For. Res. Notes N.Z. For. Serv.* 1 (3), 1950 (15–7). 1 ref.

Lists the fungi (mostly introduced) known to form mycorrhizae with exotic conifers, *Betula alba* and some Eucalypts. Little is known about mycorrhizae in indigenous species such as *Agathis*, *Podocarpus* and *Nothofagus* spp., many of which appear to have bacterial nodules instead of mycorrhizae.

1031. Dominik, T. Występowanie mykorhizy u dzikich drzew owocowych rosnących w lesie. [**Occurrence of mycorrhizae in wild fruit trees growing in a forest.**] *Acta Societatis Botanicorum Poloniae, Warszawa* 19 (2), 1948 (169–87). 11 refs. [Pol.f.] C.G.B.

Detailed description of mycorrhizae found on the roots of 14 trees belonging to the species *Pyrus communis* subsp. *pyraster*, *Malus communis* subsp. *sylvestris*, and *Prunus avium*.

1032. Dominik, T. Przyczynek do znajomości mykorhizy u wiąza polnego. [**Mycorrhizae of *Ulmus campestris*.**] *Acta Societatis Botanicorum Poloniae, Warszawa* 19 (2), 1948 (189–93). 7 refs. [Pol.f.] C.G.B.

1033. Clowes, F. A. L. **The structure of mycorrhizal roots of *Fagus sylvatica*.** *New Phytol.* 50 (1), 1951 (1–16). 40 refs. O.R.S.

(1) Both the long and the short roots of *F. sylvatica* may become mycorrhizal. The extent of the infection is not constant. Many roots form typical ectotrophic mycorrhizas with the Hartig net either limited to the epidermis or extending into the cortex where there is a variable amount of intracellular penetration by the fungus. Other roots have a typical fungal mantle, but with no intercellular hyphae. (2) The evidence of both seedling and tree root systems suggests that infection is started by

colonization of the root surface to form a mantle and that intercellular and intracellular penetration, where they occur, are secondary. (3) In some, but not all cases, mycorrhizal infection reduces the elongation of cells and causes transverse expansion of the extra-stelar cells. The volumes of cortical cells may be considerably lower than in normal roots, owing to these effects. Growth in length of mycorrhizal roots is reduced both by smaller cell elongation and by a lowering of the meristematic activity. Cell maturation occurs much nearer to the apex than in normal roots. (4) Some of the theories of mycorrhizal nutrition and causal morphology are discussed in the light of anatomical investigation. [Cf. *For. Abstr.* 12 (No. 2701).] *Author's summary.*

1034. BARNEY, C. W. **Effects of soil temperature and light intensity on root growth of Loblolly Pine seedlings.** *Plant Physiol.* 26 (1), 1951 (146–63). 28 refs. [School of Forestry and Range Management, Fort Collins, Colorado.] O.R.E.

Seedlings of *Pinus taeda* were grown in a greenhouse in glass tubes filled with soil maintained at 5° temperature intervals from 5 to 35° C. Root growth increased with increasing soil temperatures up to 25°, and then decreased at higher temperatures. The leaf/root ratios decreased with increased temperature above 5° to a minimum at 20°, but increased at higher soil temperatures. Suddenly raising the soil temperature from 20 to 35° caused a marked increase in growth during the first hour, followed by a decrease, a slight secondary increase, and after 30 hr. almost complete cessation of growth. Growth was not resumed until 6 days after the soil temperature had been lowered from 35 to 20°. Part of this delay can probably be attributed to a complete maturation and suberization of the roots which occurred at 35°. Except for an increase in starch at the lower temperatures, microscopic examination of the root tips showed only those grown at 35° to be markedly different from the others. These were rather heavily suberized and had a very small embryonic region. No mitotic figures were observed in these roots. Apparently the lowest light intensity at which growth took place was between 120 and 295 ft. candles. Loblolly Pine was not observed to have a pronounced daily periodicity in root growth, although there was a decrease in growth rate during the hours when a high transpiration rate could be expected. A study was made of the transpiration rate of Pine seedlings at various soil temperatures. The rate of transpiration for the last day of the test was found to increase with increased soil temperature up to 25° and thereafter to decrease. Sudden decrease in soil temperature produced a general lowering of transpiration rate, followed by a gradual increase towards the apparent 'stable' rate at the new temperature. Sudden increase in temperature to 35° caused an acceleration in transpiration rate followed by a gradual decrease towards the 'stable' rate. *From author's summary.*

1035. JUNOVIDOV, A. P. **K biologii sosny obyknovennoĭ. [Notes on the biology of Scots Pine.]** *Lesn. Hoz.* 1950 (5), (31–3). [Russ.]

Records the occurrence of natural grafting in Scots Pine, sometimes between stems and branches of adjacent trees, but much more frequently of their roots, in the Borovoe forest, Kazakh S.S.R. Root-grafts are commonest on shallow soils over stony strata. The woods of Scots Pine occur as 'islands' in the steppe, mostly on granite outcrops. When one of two root-grafted trees is felled, the stump continues to live, apparently as long as the uncut tree survives, and to put on annual rings, though very narrow ones. In one case, such a stump is known to have lived for 26 years after felling. Live stumps are by no means uncommon. In an experiment in which one of two root-grafted trees was ring-barked, the crown showed no die-back and grew on for 12 years, when it was cut by mistake. At the end of this period, diameter growth above the barked ring was 2·5 cm. more than below it. In another case, where two *ca.* 60-year-old trees were united by a natural graft of two branches of one to the stem of the other, a 2-m. section was cut out of the butt of the latter, leaving its crown supported only by the two branches. This crown remained alive and with no sign of imminent death at the time of writing, in spite of severe drought followed in 1935–7 by *Cenangium abietis* attack. In addition, the Pine of this region appears to be highly resistant to mechanical injuries to the stem, and stems which have been cut but not completely severed from the butt, will frequently live on in spite of their very restricted connexion with the roots.

1036. SCHÜTTE, K. **Eine interessante Feststellung über Spannungen in den Wurzelsystemen einer Buschwaldgesellschaft in Afrika. [An interesting observation on stresses in the root system of a savanna-forest community in Africa.]** *Naturwissenschaften, Berlin* 38 (14), 1951 (334). 1 ref. [G.] [Department of Botany, University of Cape Town.] O.R.S.

In a *Berlinia/Brachystegia* forest in Tanganyika, with trees about 10 m. high, the community was observed to be extremely resistant to external mechanical effects such as wind and rain. Felling shows, however, that the tree root-systems are very shallow. If an area is felled, leaving small groups or individual trees, most of these will be overthrown within a year. This is explained as the effect of the root system of the whole community. The stress on the individual tree is borne not by its roots alone but by the network of roots formed with neighbouring trees.

1037. GLOVER, P. E. **The root systems of some British Somaliland plants.** *E. Afr. agric. J.* 16 (2–4), 1950–51 (98–113; 154–73; 205–17); 17 (1), 1951 (38–50). 54 refs.

Includes scale drawings (horizontal plane) of individuals of 5 of the commoner tree species, e.g. *Acacia bussei* and *A. spirocarpa* and of a 17-m. composite bisect.

1038. GAISER, R. N., and CAMPBELL, J. R. **The concentration of roots in the White Oak forests of Southeastern Ohio.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 120, 1951. pp. 13. 14 refs.

The concentration of the smaller roots (¼-in. diam. or less) of White Oak growing in 26 even-aged stands

in southeastern Ohio, ranging in age from 30 to 114 years, and of differing but known site quality and tree density, was measured by the soil-well method. The following results were obtained:—(1) The weight of smaller roots in the A_1, A_2 and first and second subsoil horizons averaged 7·8, 3·2, 1·8 and 1·4 tons per acre-ft. respectively. The first 3 ft. of an average soil profile contains about 7·4 tons per acre of smaller roots. (2) The concentration of roots decreases rapidly in successively deeper horizons. (3) The lateral concentration of smaller roots reaches a minimum beneath the edge of the crown, and is higher near the bole. (4) When the concentration is high in the A_2 horizon, relatively high concentrations are found in the deeper horizons. (5) Root concentrations are nearly constant after well stocked White Oak stands reach the age of 30 years. (6) Neither site quality and topography nor density of stand and herbaceous cover perceptibly affects root concentration. Root concentrations are affected by the permanent wilting % in the A_2 horizon (measured from the wilting of 7-in. wheat seedlings grown in containers after the soil surface has been sealed by paraffin) and probably by bulk density, availability of moisture, and other characteristics of the soils in that and other horizons. (7) The above-ground growth of White Oak in bole volume bears no perceptible relationship to the concentration of small roots.

1039. Poljakov, Ju. A. K voprosu o razvitii kornevoĭ sistemy duba na kaštanovyh počvah. **[The development of the root system of Oak on chestnut soils.]** *Počvoved.* 1951 (6), (313–21 + plate). 14 refs. [Russ.] A.P.B.

181.5. Reproductive Behaviour

See also Nos. 949, 1086–97, 1166, 1723.

1040. Kausel, E. Notas sobre plantas ornamentales y forestales chileños. II. **[Notes on Chilean ornamental and forest plants.]** *Rev. argent. Agron.* 18 (2), 1951 (98–103). [Span.] E.M.B.

Presents data on the time required for seeds to germinate, the weight of the seeds, the time required for the plant to attain sexual maturity and the growth of the plants over a period of 4–8 years. The tree species dealt with include: *Gourliea spinosa, Maytenus boaria, Nothofagus obliqua, Boldea boldus, Crinodendron patagua, Cryptocarya rubra, Drimys winteri* and *Podocarpus andinus.*

1041. Leven, J. K. **Flowering times of Japanese Larch (*L. leptolepis* Murray) and European Larch (*L. europaea* D.C.).** *Scot. For.* 5 (2), 1951 (33–44). 3 refs.

Cf. *For. Abstr.* 11 (No. 874).

1042. Pauley, S. S. **Flowering habits in *Populus*.** *Abstr.* in *Genetics, Menasha* 35, 1950 (684). C.G.B.

In the Aspens and Balsam Poplars the flowering period and time of seed maturity appear to be very regular within the limits of ecotypic zones. Such fluctuations in flowering time from year to year as occur, apparently depend on current temperatures. In the Eastern Cottonwood (*Populus deltoides*) complex, the situation is strikingly different. Here seedfall may occur during May, June, July, or even August, during a single season. This is an adaptation of high survival value to the species. Age of first flowering in native *Populus* spp. shows considerable inter- and intra-specific variation. Cottonwoods and Balsam Poplars are, in general, somewhat slow in reaching sexual maturity, but the Aspens, especially *P. tremuloides*, may be extremely precocious. Out of several thousand individuals derived from intraspecific Trembling Aspen crosses made in the spring of 1948, a single plant produced several ♂ flowers in the spring of 1950. This was the only plant that developed lateral branches in the first season. If correlation exists between these characters, encouragement of lateral branch formation through the pinching-back of terminal shoots late in the first season may perhaps stimulate early flowering.

1043. Runquist, E. W. Ett fall av androgyna hängen hos *Populus tremula* L. **[A case of androgynous catkins on *P. tremula*.]** *Bot. Notiser* 1951 (2), [188–91]. 11 refs. [Sw.g.] O.B.D.

1044. Minina, E. G. Anomaljnoe cvetenie duba. **[Anomalous flowering of Oak.]** *Priroda, Moskva* 40 (6), 1951 (50–2). 6 refs. [Russ.] A.P.B.

After injury by late frost in June 1949 some shoots of Oak [*Quercus robur*] lost their leaves, and abnormally large buds developed in the apical 1–2 leaf axils. Dissection revealed that these buds contained either ♀ inflorescences only, or inflorescences of mixed sex, often with an unusually large number of ♀ flowers. Most of the buds failed to develop, but some produced ♀ inflorescences with long peduncles. Of the buds that so developed, some died during the autumn, and in the spring the remainder each produced 1–2 vegetative shoots. No explanation can be given at present for this behaviour.

1045. Hyde, H. A. **Pollen output and seed production in forest trees.** *Quart. J. For.* 45 (3), 1951 (172–5). 7 refs. [National Museum of Wales, Cardiff.]

From 1942 onwards, pollen has been trapped from the air continuously on adhesive slides changed daily over periods of a year or more at 14 stations in Great Britain, and the catch analysed at Cardiff. Tree pollens predominate during January–May inclusive and they make up *ca.* 34% of all pollen collected throughout the year. The catch of a particular species varies widely from year to year and an attempt has been made to correlate the pollen data with estimates of seed production for different species. In making these comparison care must be taken to relate the forest year during which a particular seed crop was collected with the appropriate pollen year. Data are given for Alder, Ash, Beech, Birch, Elm, Oak, and Pine, and it is concluded that the correlation does exist and that statistics on atmospheric pollen may well help foresters to predict probable seed crops. Observations are being continued.

1046. Wereff, R. Über die Lebensdauer der Pollenkörner in der freien Atmosphäre. **[The life of pollen grains exposed to the atmosphere.]** *Biol. Zbl.* 70 (7/8), 1951 (354–67). 26 refs. [G.g.] E.M.B.

When exposed to the atmosphere in a dark room at room temperature, the pollen of various plants, including *Betula pendula* and *Pinus mugo*, remained viable for 20–48 days. Pollen of other species, e.g. *Sambucus nigra*, showed a decline in viability after 7–8 days. After 8 hours' exposure to the sun, all the pollens tested showed a decrease in viability, especially if the pollen was already some days old. When exposed to ultra-violet rays for 3-hr. and 6-hr. periods, pollen of nearly all plants tested declined in viability. Spring-flowering plants, such as *Alnus glutinosa* and *Salix caprea*, showed a decline in pollen viability of 60–90% after 3 hours' exposure to ultra-violet rays. It is likely, therefore, that the adverse effects of sunlight are due in part to ultra-violet rays.

1047. FOLEY, T. A. **Rate of fall of Kauri (*Agathis australis* Salisb.) seeds in quiet air.** *For. Res. Notes N.Z. For. Serv.* 1 (2), 1950 (32–40 + 2 gphs.) 2 refs.

The Kauri tree produces seeds having a characteristic average rate of fall which varies slightly with the quality of the crop. The heavier the seed, the faster the rate of fall; it is emphasized that this is not true of all species.

1048. ROHMEDER, E. Beiträge zur Keimungsphysiologie der Forstpflanzen. **[Contributions to the physiology of germination of forest plants.]** Bayerischer Landwirtschaftsverlag, München. 1951. pp. 140. Numerous refs. [G.g.]

Collected papers, hitherto unpublished, dealing with work at the Institut für Forstsamenkunde und Pflanzenzüchtung, Munich, on the following topics:– (1) *Retarded germination in fleshy fruits ('berries'):* The fruit pulp of *Sorbus* spp., *Hippophaë rhamnoides*, *Crataegus coccinea*, *Sambucus racemosa* and *Berberis vulgaris*, contains substances that inhibit germination. The effect varies in degree with the species concerned, but further research is necessary to place the species in order and to determine the influence of seed maturity etc. Seed of such species should be extracted from the fruit as soon as possible after ripening, and washed several times. If seed is left long in the fruit, germination will be delayed or even prevented. (2) *The turpentine of Silver Fir seed,* tested on high-grade, rapidly germinating Spruce seed, delayed or inhibited germination. Its natural role is presumably to prevent precocious germination in autumn. Possibilities of extracting it without injury to the seed are being studied. (3) *Swelling and drying back during the germination of Norway Spruce and Scots Pine seed:* Even after soaking to saturation in water, seed of these species can be dried at room temperature to its original weight, and stored dry for a further 6 days, without materially impairing its germination capacity, so long as the radicle has not broken through the seed-coat. Once this has happened, the embryo is very susceptible to drying; hence if seed has swollen after sowing there should be no need to water the beds in a dry spell unless the radicles have broken through, but if this has occurred, watering is essential. (4) *Germination of Sorbus domestica:* Data are given on seed weight and seed yield per kg. of fruit. The fruit contains a substance strongly inhibiting germination, and sowing of whole fruits is useless. Dormancy can be broken by 2 months' cold moist storage, beginning in Oct. or Nov., at *ca.* 4° C., or by autumn sowing. Seed should be extracted on ripening and either sown, or stratified in moist sand indoors or in the open. If germination occurs too early, some protection must be given against severe frost, but early germination may be prevented by exposing the stratified seed periodically to frost between Dec. and March. (5) *Germination of Rosa canina, R. rugosa and R. rubiginosa:* Dormancy is removed by stratifying in moist sand at *ca.* 5°, but the period required is long (usually more than 6 months, and even 8 or 14 months may not give maximum germination in some cases). For official tests, the seed could be kept in moist sand in a refrigerator and the test concluded when most of the seed had germinated, applying the cutting test to the remainder. The period required (1–4 years) is unpredictable and too long for the trade, but for rapid tests giving approximate results the Na selenite or tetrazolium methods could be applied. (6) *Germination of Sorbus aucuparia:* Besides the effect of the fruit pulp (see (1)), a second factor prevents germination, viz. the failure of the embryo to grow at temperatures over 10°. The latter can be overcome by stratification in moist sand or peat-mould at 4° for 4–5 months (or, according to Flemion, at 1° for 2–4 months). Daylight makes no material difference to germination if the temperature of pretreatment has been right. In practice, early autumn sowing is best, or if that is impossible, dry storage followed by stratification for *ca.* 3 months before the germination date desired, in medium-moist sand. (7) *Stratification of Beech mast:* Dormancy can be overcome by stratification in moist sand at *ca.* 4° and germination will occur within a few weeks or a few months, according to the previous storage conditions, moisture content of the seed etc. A rapid estimate of germinative capacity can be made by the tetrazolium test. Comparative tests by this method and actual germination tests show that the number of seeds coloured is approximately equal to the germinative capacity. If, however, the seed has lost too much moisture, the tetrazolium method will give over-high estimates. Storage conditions should aim at preventing any prolonged period of drying out. Seed stored too dry should be stratified at least 4 weeks before sowing, in moist sand at 4–6°. (8) *Germination of tree seeds at constant and alternating temperatures, with reference to the effect of daylight:* Germination of Norway Spruce, Scots Pine, European Larch, Douglas Fir, *Alnus glutinosa* and *Betula verrucosa*, was neither impaired by light nor promoted by darkness. In some species, notably Pine and Birch, light appeared to favour germination. In many cases, alternating temperatures (20 to 30, and 20 to 25°) appeared more favourable than a constant one (25°), especially for seed of medium quality, weakened by ageing or unsuitable treatment, but the effects varied so much with species and other factors that no generally valid conclusion can be drawn. Alternating temperature and daylight appear to be partially interchangeable factors, but in some cases their effects were additive.

High-grade, fresh seed germinated about equally well, especially in light, whether temperature was constant or alternating. Seed of much lowered vitality, however, was unfavourably affected by alternating temperature. In view of the widely differing reactions of individual species and of individual seed lots within a species, it is considered advisable to run tests for a given seed lot under conditions as varied as possible—at least one series with constant and another with alternating temperature. (9) *Effect of burning preparatory to regeneration, upon germination and early development on a dry Pine site:* In a trial in the Nürnberg-Süd forest district, 9 species (Birch, *Alnus glutinosa*, European Larch, Scots Pine, Norway Spruce, Austrian Pine, Oak, Beech and Silver Fir) were sown on an area where the ground cover had been burned, and on an adjacent control area. All the species germinated about equally well on burned plots and controls, there being no evidence of a higher plant % in Birch, Scots Pine, Beech and Oak on the burned, or in Spruce and Austrian Pine on the unburned plots. As early as the 2nd year after sowing, however, all species were healthier and showed better growth and less mortality on the burned plots. At the end of the trial, after 6 years, this remained true, and differences in height growth varied from 4 times that of controls in Larch to 1·5 times in Scots Pine. The favourable effect of burning is attributable to removal of competition, especially from heather, and to improvement in the humus cover together with enrichment of the soil by nutrients supplied in the ash [cf. *For. Abstr.* 13 (No. 274)]. (10) *The fat content of dormant and germinating Beech mast:* The content (40–50% of the dry weight of fruits with their coats removed) remained more or less constant during germination until the radicle attained *ca.* 50 cm. in length. Fat is only used up to any considerable extent as the cotyledons develop and turn green. The protein content remains constant until the early stages of development of the first true leaves. (11) *Experiments on frost injury to Beech seedlings:* Freezing experiments showed that susceptibility varies markedly with stage of development. The tender, unfolding first leaves are killed by 1 hr. at – 2° but fully developed leaves only a few days older are uninjured by this, or by 45 min. at – 3° followed by exposure to strong sunlight. When cooled below zero, but not too near the critical temperature, plants recover equally well when exposed to shade or sun; but if kept near the critical temperature (*ca.* – 4°), they will recover only if warmed up gradually in shade. When breeding Beech for late flushing it should be remembered that an exceptionally late frost may injure late-flushing strains more than earlier flushers if the former are frozen at the tender stage. (12) *Scarification of Broom seed:* Cellulose and paper can be made from Broom in a process devised by M. Seyfarth, and if it can be used on a large scale, this will open up wide prospects for disposing of unwanted Broom or growing it on waste land [cf. also *For. Abstr.* 11 (No. 2047); 12 (No. 2261 and p. 399)]. The question of cultivation has been taken up by the Firma Wauckosin, Frankfurt a.M., and the Faser-Veredelung-Gesellschaft, and it was of interest to discover economical means of breaking dormancy due to the hard seed-coat. Of the methods tried, scarification with broken glass or corundum in a revolving drum was the most effective, besides being simple and very cheap. Where a drum is not available, 2 hr. in conc. H_2SO_4 is the next most effective. Immersion in boiling water for 10 sec. was much less effective, and should only be used if neither of the first two methods can be applied. It is estimated from limited trials on medium good garden soil that annual coppicing of Broom would give a crop having an air-dry weight per ha. of 19·2 metric tons in the 2nd and 59·4 in the 3rd year of life. (13) *Storage of Norway Spruce seed of different moisture contents:* The moisture content in autumn of ripe seeds still enclosed in the cones was 19–20%. Natural or artificial extraction approximately halves this value. Seeds extracted by picking cones to pieces and stored at their initial moisture content of 19–20% in air-tight vessels, completely lost their viability after 4 years. Seed extracted in the same way was dried in desiccators to *ca.* (*a*) 10%, (*b*) 9%, (*c*) 8% and (*d*) 3% initial moisture content before storing in air-tight vessels. Germination capacities after storage were: (*a*) 0 after 4 years; (*b*) over 80% after 4 years but dropping rapidly thereafter; (*c*) 74–82% after 7 years; and (*d*) 73–77% after 7 years. The optimum content for storage, presumably *ca.* 6–7%, remains to be determined, but it is evident that if seeds are extracted without using heat, they will need to be dried considerably before storage. (14) *'Sprouting-power' tests:* In Derlitzki's 'sprouting-power' test (*Triebkraftprobe*) seed must both germinate and break through a 10-mm. layer of sand (particle size > 2 mm.), records being taken at 10, 20 and 30 days. If the results of this test diverge at all widely from those of germination-capacity tests, there are grounds for suspecting ageing, weakening or injury to the seeds, and the plant % in open sowings is likely to be low. Parallel germination-capacity and sprouting-power tests with many lots of Scots Pine and Norway Spruce seed, showed that in Pine the figures for sprouting power display much more dispersion, and the average values are lower, than in Spruce. When, in parallel tests of germination capacity, the different factor combinations give considerably different results, there is always reason to suspect some lowering in vitality of the seed, and a sprouting-power test is advisable. Sometimes, even when the results of such parallel tests agree, sprouting-power tests will reveal wide differences. A few results are also included for similar tests on Larch and *Pinus strobus*. (15) *Comparative germination tests with Norway Spruce, Scots Pine, European Larch and Alnus glutinosa at different seed-testing establishments:* Gives results obtained with the same seed lots at 3 German seed-testing stations and one at Warsaw, in parallel tests under varied conditions and in different types of apparatus. Differences in results under different conditions at one and the same station and at the different stations, were small for high-grade Spruce and Pine seed of good germination capacity, and fell within the limits laid down in seed-testing regulations. This was not true of lower-grade seed: indeed, if sampling is correctly done and the seed

not very uneven in quality, wide discrepancies in results can be taken to indicate something amiss with the seed. Better agreement for such seed should be attainable by tightening up the rules, e.g. by specifying for a given species only one apparatus, one temperature range and closer moisture control. For Larch, owing to the unavoidably high proportion of empty seed, variations were wider than for Pine and Spruce, but results indicate that sufficient agreement could be achieved by using enough replications to smooth out the effects of uneven distribution of empty seed. Alder seed usually contains many impurities and often many seeds attacked by *Sclerotinia alni*. It is difficult to estimate purity, and in this respect the variation in results at different stations exceeds the limits given by the rules, and the same is true of the germination-capacity test. It is therefore proposed that the purity test be dropped and that germination be tested on the basis of the number of seeds germinating in 1 g. of uncleaned commercial seeds. The same is proposed for *Alnus incana*, *Betula verrucosa* and *B. pubescens*, and this method has been approved as permissible in the revised German seed-testing rules of 1949.

1049. Goo, M. **Water absorption by tree seeds during germination**]. *Bull. Tokyo Univ. For.* No. 39, 1951 (55–60). [Jap.e.]

Experiments were carried out between 18 March and 17 May, 1949, on seeds of *Cryptomeria japonica*, and between 29 Nov. and 19 Dec. on seeds of *Pinus densiflora* and *P. thunbergii*. The seeds were placed in Petri dishes with water and kept in a thermostat, at 20° C. for *C. japonica* and 25° for the Pines. The weight of water absorbed was obtained by measuring the weight of the seeds every 24 hr. Results, given in graphs, show that there are 3 stages of absorption: (1) a quick rise in weight during the first 1–2 days; (2) a period when the weight increases slowly or not at all; and (3) a further quick rise. (1) Occurred with both dead and viable seeds, and is, therefore, assumed to be caused by diffusion of water. (3) Occurred only with viable seeds. (2) Varies in length, lasting longest for *C. japonica*, which was the slowest in germinating, and being absent in seeds of the Pines with the seed-coats removed; these germinated rapidly.

1050. **Germination test with seeds of *Hardwickia pinata* obtained from mother trees of different girth classes.** *Rep. For. Res. Madhya Pradesh 1948/49*, 1951 (6–7).

Germination % of seed from trees of all girth classes was high (79·2–80·6 for girths from 19 to 43 in. and upwards, and 72·6 for girths up to 18 in.).

181.6. Life Form, Habit. Post-Seedling Development and Form. Crown Form and Crown Relations

See Nos. 997, 1004, 1035.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See Nos. 1014, 1042.

181.8. Phenology

See also Nos. 940, 1041–2, 1282, 1494, 1544.

1051. JACQUIOT, C. Sur les facteurs déterminant la reprise de l'activité du cambium chez diverses essences forestières. [**The factors controlling the resumption of cambial activity in different tree species.**] *C.R. Acad. Sci., Paris* 232 (25), 1951 (2350–2). 5 refs. [F.] O.R.S.

Cultivation *in vitro* of cambial tissues of *Populus tremula*, *Betula verrucosa*, *Fagus sylvatica*, *Quercus pedunculata* and *Q. sessiliflora*, *Castanea vesca*, *Ulmus campestris*, *Robinia pseudoacacia*, *Tilia parvifolia* and *Sambucus nigra*, showed that in most species the cambial tissue resumed its activity when exposed to a sufficiently high temperature in the absence of any growth-regulating substance. The tissue from *Sambucus nigra* proliferated only on a medium containing pantothenic acid. In *Fagus sylvatica* ability to proliferate in the absence of growth-regulating substances did not appear to be constant. In all species the lignification of newly formed tissues was aberrant and incomplete.

182. *Synecology, Plant Sociology: General, Principles and Methods*

1052. TREPP, W. Forstwirtschaft und Pflanzensoziologie in der Schweiz. [**Forestry and plant sociology in Switzerland.**] *Vegetatio* 3 (1/2), 1950 (1951), (134–43). 28 refs. [G.] A.P.B.

A review of research in this field.

182.1. Palaeoecology. History of Vegetation

1053. FREY, D. G. **Pollen succession in the sediments of Singletary Lake, North Carolina.** *Ecology* 32 (3), 1951 (518–33). 25 refs.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 1074, 1195, 1446.

1054. ROSAYRO, R. A. DE. **Ecological conceptions and vegetational types with special reference to Ceylon.** *Trop. Agriculturist, Ceylon* 106 (3), 1950 (108–21 + 1 map + 10 plates). 16 refs.

A discussion of the fundamental ecological concepts of succession, development and the climax, and of the reasons for the divergence between the 'monoclimax' and the 'polyclimax' schools of thought. An analysis of the natural vegetation of Ceylon shows that the 'mônoclimax' concept is more in accord with the actual vegetation types. A brief classification of the major vegetational types of Ceylon is presented. [Cf. *For. Abstr.* 7 (No. 1116); 9 (Nos. 785, 1486).] *From author's summary.*

1055. PURI, G. S. **Surface geology, vegetation and plant succession.** *Indian For.* 76 (5), 1950 (199–209).

A study of the distribution of Ash in some woods in the south of England.

1056. LINDSEY, A. A. **Vegetation and habitats in a southwestern volcanic area.** *Ecol. Monogr.* 21 (3), 1951 (227–53). 27 refs.

Analyses plant communities and succession on Tertiary and recent lava flows in New Mexico.

182.5. Synecological Measurements and Methods

See No. 1074.

187. *Vegetation Types*

See also Nos. 891, 896–8, 990, 1019, 1054, 1086–7, 1089, 1105, 1118, 1187, 1435.

1057. Weltforstatlas: Übersicht der Waldverbreitung in Nord-Eurasien. **[World forestry atlas: [a map showing] the distribution of forests in northern Eurasia.]** Zentralinstitut für Forst- und Holzwirtschaft in Hamburg-Reinbek. 1949. pp. 1.

1058. Reichling, L. Les forêts du Grès de Luxembourg. **[The forests of the sandstone areas of Luxembourg.]** *Bull. Soc. Bot. Belg.* 83 (2), 1951 (163–212). 13 refs. [F.] O.B.D.

1059. Schmid, E. Coup d'oeil sur la flore et la végétation des Alpes. **[Brief survey of the flora and vegetation of the Alps.]** *Bull. Soc. bot. France* 98 (10), 1951 (28–31). [F.] O.B.D.

1060. Monographies régionales. **[Regional monographs.]** *Bull. Soc. bot. France* 98 (10), 1951 (41–116 + 14 plates). Numerous refs. [F.] O.B.D.

Ecological and botanical studies by different authors on individual regions of the Alps, presented at the extraordinary session of August 1950, held in the Alps in connexion with the International Botanical Congress.

1061. Ilić, E. Fitocenološka istraživanja u šumama Majdanpečke domene. **[Phytocoenological investigations in woods of the Majdanpek estate.]** *Šum. List* 75 (3/4), 1951 (142–7). 11 refs. [Croat. croat.f.]

Presents the results of studies made in 1947–8 of the flora and vegetation types of the Majdanpek estate (the property of the University of Belgrade), the area of which is *ca.* 8,000 ha. Nearly 300 species have been found, and the following associations are recognized: *Fagetum montanum serbicum* (*Fagus moesiaca*), *Quercetum montanum* (*Quercus sessiliflora*), *Querceto-carpinetum serbicum* (*Quercus sessiliflora*/*Carpinus betulus*), *Acereto-fraxinetum* (*Acer pseudoplatanus*/*Fraxinus excelsior*), and the association of *Fraxinus ornus* and *Acer monspessulanum*. There are no conifers on the estate. [Cf. *For. Abstr.* 12 (No. 1806).]

1062. Horvat, I. Istraživanje i kartiranje vegetacije primorskih obronaka zapadne Hrvatske i područja izvora Kupe. **[Exploration and mapping of the vegetation of the maritime slopes of Western Croatia and of the Kupa headwaters.]** *Šum. List* 75 (6), 1951 (221–35). [Croat.f.]

[Cf. *For. Abstr.* 12 (No. 2747).] A preliminary communication. In addition to the maps of the Risnjak and Snježnik mountain areas, two new maps (scale 1 : 25,000) have been prepared, showing the Susak area, including a considerable part of the central Gorski Kotar mountains and large areas of southern forests, thickets, and stony soil, down to Bakarac and Kraljevica. The maps cover *ca.* 60 different associations, including 24 forest associations and sub-associations. The central part of the mapped areas is covered by Beech and Spruce forests. To the south, Spruce disappears, and the association *Fagetum montanum* is developed on the landward side, and *Fagetum seslerietosum* on the southern slopes. Both associations merge into forests of Hop Hornbeam (*Ostrya carpinifolia*) and *Fraxinus ornus*, represented by two associations: *Ostryeto-Ericetum* and *Ostryeto-Seslerietum autumnalis*. The lowest zone of the southern parts consists mainly of *Carpinetum orientalis croaticum*, mostly in scrub form.

1063. Sumida, Y. **[Study of the *Tsuga diversifolia* natural stands in the Titibu Experimental Forest [of Tokyo University], their composition, constitution and regeneration. Suggestion for a new method of regeneration.]** *Bull. Tokyo Univ. For.* No. 26, 1939 (33–79). [Jap.jap.]

A detailed description and analysis of the area, which lies between 700 and 1,900 m. and is typical of the temperate and alpine forest zones of the island Numerous tables and graphs are given, showing the tree distribution by diameter and height classes, volume per diameter class etc., for various representative plots. The stands are predominantly *Tsuga*, with a moderate admixture of hardwoods in the lower diameter classes, and largely even-aged and two-storeyed forest. The *Tsuga* is of slow growth and inferior quality, with a high ratio of dead and decaying trees. Specific recommendations for its regeneration and tending are given, including retention of the hardwood mixture. While plot counts show a total volume of 400–500 cu.m./ha., the average for the whole forest is estimated at 350.

1064. Suzuki, T., and Hatiya, K. **The forest vegetation of Izu peninsula.** *Bull. Tokyo Univ. For.* No. 39, 1951 (145–69). [Jap.e.]

An ecological study of the relicts of natural forest. Most tables and diagrams have English captions.

1065. Maeda, T., and Shimazaki, Y. **Studies on the vegetation of Chichibu mountain forest (1). The plant communities of the subalpine and alpine zones.** *Bull. Tokyo Univ. For.* No. 39, 1951 (171–84). [Jap.e.]

1066. Cousens, J. E. **Some notes on the composition of lowland tropical rain forest in Rengam forest reserve, Johore.** *Malay. Forester* 14 (3), 1951 (131–9 + 4 profile diagrams). 8 refs.

1067. Portères, R. Problèmes sur la végétation de la Basse Côte d'Ivoire. **[The vegetation of the lower Ivory Coast.]** *Bull. Soc. bot. France* 97 (7/9), 1950 (153–6). [F.] O.B.D.

Discusses the soils and climate of the region and their relationship to the forest types.

1068. Mangenot, G. Les forêts de la Côte d'Ivoire. **[The forests of the Ivory Coast.]** *Bull. Soc. bot. France* 97 (7/9), 1950 (156–8). [F.] O.B.D.

Describes some of the plant associations of this region, and discusses difficulties in defining them. [Cf. *For. Abstr.* 13 (Nos. 172–3).]

1069. Mangenot, G. Essai sur les forêts denses de la Côte d'Ivoire. **[Research on the rain forest of the Ivory Coast.]** *Bull. Soc. bot. France* 97 (7/9), 1950 (159–62). 3 refs. [F.] O.B.D.

Analyses of vegetation were carried out by the author and his collaborators by making counts on sample plots ranging from 200 to 500 sq. m. in area. The studies demonstrated clearly the presence of characteristic group societies and associations, of which the *Tarrietio-Mapanietum* and the *Heisterietum* are the most important. The extent and characteristics of these associations are briefly discussed.

1070. Heim, R. Sur la forêt de Basse Côte d'Ivoire. **[On the forests of the lower Ivory Coast [with discussion].]** *Bull. Soc. bot. France* 97 (7/9), 1950 (162–7). [F.] O.B.D.

The author denies that associations can be properly defined in vegetation as complex as the Ivory Coast forests.

1071. Hedberg, O. **Vegetation belts of the East African mountains. Results of the Swedish East Africa Expedition, 1948, Botany, No. 1.** *Repr.* from *Svensk bot. Tidskr.* 45 (1), 1951. pp. 202 + 6 plates. Numerous refs.

1072. Louw, W. J. **An ecological account of the vegetation of the Potchefstroom area.** *Mem. bot. Surv. S. Afr.* No. 24, 1951. pp. 105 + 3 maps. Numerous refs. Price 7*s.* 6*d.*

1073. West, O. **The vegetation of Weenen County, Natal.** *Mem. bot. Surv. S. Afr.* No. 23, 1951. Pp. 183. Numerous refs. Price: 7*s.* 6*d.*

1074. Curtis, J. T., and McIntosh, R. P. **An upland forest continuum in the prairie-forest border region of Wisconsin.** *Ecology* 32 (3), 1951 (476–96). 52 refs.

The upland hardwood forests of S.W. Wisconsin were studied by random sampling of undisturbed stands in an area of 160 × 230 miles. The relative ecological importance of each tree species in each stand was expressed by a summation index (the 'importance value') of the relative frequency, relative density and relative dominance. The most important species were then arranged in a scale beginning with the pioneer species, *Quercus macrocarpa*, *Populus grandidentata*, and *Q. velutina*, and ending with the climax species *Ostrya virginiana* and *Acer saccharum*. Arbitrary numbers from 1 to 10, called 'climax adaptation numbers' were assigned to the species to indicate the degree to which they approach the climax *Acer* in autecological characteristics, and these numbers were used as a means of weighting the importance values of each species in a stand as determined by field sampling. The summation of these weighted numbers resulted in an index which served to locate the stand along a gradient. Such a gradient of communities is here called a 'vegetational continuum', and the use of this concept for the co-ordination of data on animal populations etc. is discussed. *From authors' summary.*

1075. Munz, P. A., and Keck, D. D. **California plant communities—Supplement.** *El Aliso* 2 (3), 1950 (199–202). L.S.

Cf. *For. Abstr.* 12 (No. 1007).

1076. Soriano, A. La vegetación del Chubut. **[The vegetation of the Territory of the Chubut.]** *Rev. argent. Agron.* 17 (1), 1950 (30–66). 26 refs. [Span.] E.M.B.

2. SILVICULTURE

See also Nos. 885, 890, 1754, 1785.

1077. Fritz, E. **Some principles governing the growing of Redwood crops.** *Proc. West. For. Conserv. Ass.* 41, 1950 (23–5).

Discusses regeneration, response to release, selective cutting, thinning, and logging of virgin and second-growth stands of *Sequoia sempervirens.*

1078. Fernandes, C. Taveira, and Guerreiro, M. Gomes. O castanheiro no distrito de Bragança. **[Chestnut in the Bragança district.]** *Publ. Serv. flor. aqüic. Portugal* 12 (1/2), 1945 (5–40). [Port.e.]

A study made preliminary to a plan for reconstituting the Chestnut forests of Portugal. The distribution of Chestnut in relation to rainfall and altitude is examined. The best conditions appear to be an altitude of 700 m. with an annual rainfall of 800 mm. Local practices in the cultivation and management of Chestnut are described, and the foci of *Phytophthora cambivora* attacks are mapped.

1079. Fernandes, C. Taveira. O castanheiro no distrito de Vila Real (concelhos das zonas centro e leste). **[Chestnut in the region of Vila Real (eastern and central administrative districts).]** *Publ. Serv. flor. aqüic. Portugal* 12 (1/2), 1945 (41–75). [Port.e.]

Reviews the climate, soils and distribution of tree species, with particular reference to *Castanea sativa*, and discusses the importance of Chestnut in local economy, cultivation methods, reasons for the disappearance of the tree (with a brief review of *Phytophthora cambivora* attack in the area) and possibilities of restocking the depleted forests.

22. SILVICULTURAL SYSTEMS. CONSTITUTION AND COMPOSITION OF STANDS; FORMS OF STAND

221. *High Forest Systems*

See also No. 1088–9, 1409, 1452.

1080. Gračev, A. P. Pravila rubok glavnogo poljzovanija v ravninnyh lesah SSSR. **[Rules for principal fellings in the plains forests of the U.S.S.R.]** *Lesn. Hoz.* 1950 (5), (49–54). [Russ.]

Presents the official rules confirmed by the Ministry of Forests on 6 March 1950, chiefly in tabular form (but with discussion and annotations on matters of detail), giving for Scots Pine, Spruce, Oak and hard hardwoods, and soft-wooded hardwoods:– (1) zone concerned; (2) type of principal felling; (3) regeneration, whether natural or artificial; (4) width of coupes; (5) whether adjacent coupes are to be felled successively or not; (6) period between fellings on adjacent coupes; and (7) number of seedbearers.

to be left per ha. Notes are also included on Larch, Siberian Pine, and Fir. [Cf. *For. Abstr.* 13 (p. 34).]

1081. Ryžkov, S. V. Lesovodstvennyĭ metod koncentrirovannoĭ rubki. [**'Concentrated fellings' as a silvicultural system.**] *Lesn. Hoz.* 1950 (5), (55–8). 4 refs. [Russ.]

An account, in general terms, of this silvicultural system, a modified form of clear felling which was worked out by the author in 1931–4. Its essential features are (1) the leaving of groups of seed-bearers—generally as strips of mature trees round patches of young or other unmerchantable growth—to supplement the seed supply from and the protection afforded by the forest margin, thus rendering possible (2) much larger coupes. Advantages are the concentration of operations upon large, coherent blocks of land at any given time, since the width of coupe can be enlarged from the 50–100 m. necessary for ordinary clear fellings to 1,000 m. or more, with consequent improvement in conditions for mechanization, and the elimination of the need for cutting patches of unmerchantable growth, combined with adequate natural seeding and protection of the felled area. Adjacent coupes can be felled successively at intervals as short as 3 years without risk of windthrow or damage to regeneration. The groups bordered by seedbearers can be 0·5–5 ha. in size, spaced 150–200 (rarely, to 300) m. apart, thus amounting to 10–15% of the total area cut over (7–10%, by volume, of the growing stock). Their actual size, within the range given, depends on the extent of the unmerchantable groups, wind resistance of the seedbearers, and the requirements as to protection and regeneration etc. To their essential objects of providing seed and shelter may be added others such as aesthetic considerations and the preservation of ground flora and animal life; these factors, too, will affect their size. The groups, in fact, should constitute 'islands' in which forest conditions are maintained. In form they may be roundish or polygonal with angles of not less than 90° (to avoid windthrow), preferably on raised ground to facilitate seed dispersal. Their period of existence as groups will depend on (*a*) the time taken to complete their several functions, and (*b*) their economic value or value as ecological types. Application of this system is said to have given good results in the northern forests, e.g. of Karelia [but details are not given].

1082. Podelmengo, O. La martellate nei boschi a taglio saltuario dell'Alto Cadore. [**Marking woods in the Alto Cadore for a selection felling.**] *Ital. for. mont.* 6 (4), 1951 (199–200). [It.]

1083. Lemps, F. de. Futaie jardinée par bouquets et futaie de chêne par bouquets. [**The group selection system and group regeneration of Oak.**] *Rev. for. franç.* 1951 (9), (577–8). [F.]

The irregular seed production and high light requirements of Oak, make it impossible to apply to it the strict group selection system developed for conifers. Possible adaptations are briefly discussed.

222. *Coppice, Pollarding and Lopping Systems*

See also Nos. 1085, 1094–5, 1213, 1216, 1453–4.

1084. Jacobs, M. R. **Growth problems in a Eucalypt coppice forest of poor quality.** *Aust. For.* 14 (2), 1950 (59–71).

The growth of a poor-quality coppice forest of mixed Eucalypts in the Australian Capital Territory is described. Problems encountered in the management of such a forest and the treatment necessary to perpetuate the stand are discussed. Seedling regeneration takes a long time to become established in the stand, but is necessary if the forest is to continue in a healthy condition. The measures recommended to ensure the perpetuation of the test area as coppice forest are:—reasonable protection against fire, grazing and rabbits; removal of large old veterans at the initial cut; burning of slash; establishment of a number of felling faces at right angles to the main seed-shedding winds, and organization of successive fairly narrow fellings into the wind. Thinning is not necessary. From a coppice rotation of 30–35 years, one may expect a m.a.i. of 30 cu. ft./acre of firewood and small produce.

22. *Changes of Silviculture System. Conversion (by System or Species)*

See also No. 1216.

1085. Guichard, X. Le chêne dans l'évolution des taillis sous futaie de la Haute-Saône. [**Oak in the evolution of coppice-with-standards in the Haute-Saône.**] *Rev. for. franç.* 1951 (9), (579–89). [F.]

Describes a method of conversion to high forest, by groups, and making use of other species (notably Hornbeam) as well as Oak to help in the process. The importance of synchronizing fellings with mast years is emphasized.

23. REGENERATION AND FORMATION OF STANDS

See also Nos. 1437, 1785.

1086. Trosjko, I. K. Vozobnovlenie v arčevnikah. [**Regeneration in tree Juniper stands.**] *Lesn. Hoz.* 1950 (5), (84–5). [Russ.]

The Archa is a tree Juniper [*Juniperus seravshanica*?] which grows in pure stands chiefly on the western Tian Shan, Chatkal, Turkestan, Zeravshan and Hissar mountain ranges at elevations of 1,500–3,500 m., forming forests of great importance to water conservation in the catchments of the Syr Darya, Amu Darya and other rivers of this region. The species is very slow growing, reaching some 20 m. in height and 36 cm. d.b.h. at 300 years of age. Veteran trees are as much as 500 years old. Many of the stands are open, with a density of 0·3–0·4; the best stands, with a density of *ca.* 0·8 and a mossy ground cover, occur on northern aspects. Natural regeneration is generally very poor, occurring only under the cover of trees or bushes; even on the favourable northern slopes, where copious 1-year seedlings may be found, only a few, more or less stunted specimens survive. Artificial regeneration by sowing or planting is difficult and has not hitherto been properly studied, though there are a

few successful sowings and plantings in small openings on northern slopes. The Central Asian Forestry Research Institute is, however, making trials of sowing and planting on a considerable scale in the Zamin forest at an altitude of 2,500 m. All work on regeneration is very important in view of the desirability of securing denser cover on the catchments. The climate is severe (annual precipitation up to 500–600 mm., no rain in June–Sept.; up to 150 frost-free days), and introduction of fast growing exotics would not be easy, in fact any that might tolerate such conditions should probably be used only to supplement regeneration of Archa. Stumps of Archa coppice freely. Natural layering also occurs and its effectiveness as a means of regeneration could be improved if aided by man. Natural regeneration from seed can be assisted by providing shelter and shade in the form of felling debris or cut branches.

231. *Natural Regeneration*

See also Nos. 911, 1048, 1063, 1080–1, 1083–4, 1118, 1197, 1409, 1453.

1087. DENUYL, D. **Establishment and growth of seedling reproduction of Sugar Maple (*Acer saccharophorum*).** *Proc. Indiana Acad. Sci.* 58, 1948 (73–5). A.P.B.

Data based on permanent sample plots established in 1931 in the Beech/Maple forests of Indiana, show that an initial stand of over 1 million *Acer saccharum* seedlings per acre will be reduced in 15 years' time to 35,000 or less. After many decades competition for growing space will result in the establishment of a forest with about 40 Sugar Maples plus 30–40 other hardwood associates, per acre.

1088. SUSMEL, L. Struttura, rinnovazione e trattamento delle abetine del Comelico. [**Structure, regeneration, and treatment of the Spruce and Spruce/Silver Fir stands of Comelico.**] *Ital. for. mont.* 6 (4), 1951 (177–98 + 4 dgms. + 12 photos). 38 refs. [It.it.f.]

An investigation of Spruce regeneration was made on 700 ha. of pure Spruce and Spruce/Silver Fir in the Belluno Alps. This is selection forest, with rather poor growing stock (averaging 280 cu.m./ha. for mixed and 180 cu.m./ha. for pure Spruce stands). Where there is a mixture of Silver Fir it was found that the Spruce regenerated more or less regularly and was apparently unaffected by the degree of illumination. In pure Spruce stands, however, regeneration was often lacking, and it is concluded that, though Spruce can regenerate itself in the absence of light, the soil under pure Spruce needs light in order to break down the accumulation of raw humus. It is considered that regular thinning will usually suffice to obtain Spruce reproduction in the pure Spruce stands.

1089. METREVELI, P. A. Estestvennoe vozobnovlenie i glavnye rubki v gornyh sosnovyh lesah vostočnoĭ Gruzii. [**Natural regeneration and principal fellings in the montane Pine forests of eastern Georgia.**] *Lesn. Hoz.* 1950 (5), (58–61). [Russ.]

Makes recommendations for these almost pure Pine [*P. sylvestris*?] forests, based on observations in the Gori demonstration forest of the Georgian Academy of Sciences. Four types, occurring at elevations of 1,000–1,700 m., are recognized: (1) Dry Pine forest, on poor, dry soil, on S.E.–S.W. slopes with gradients of 20° or more. (2) A *Sanicula* type on fresh, relatively rich soil, on N.–N.W. slopes of up to 20°. (3) A *Festuca* type on fresh but relatively poor soils on N.–N.W. slopes, in deep ravines with gradients of 30–50°. (4) A *Cytisus* type on dry, relatively rich soil, mostly on E.–N.E. slopes of up to 20°. The chief problem in regeneration fellings is to admit sufficient light for the Pine seedlings without risking serious mortality through drought or competition from herbaceous species and without endangering the protective value of the forest through erosion. In type (1) natural regeneration seems to have occurred at intervals of about 25 years, presumably through the coincidence of a good seed year with favourable weather. Any exposure of the soil is liable to increase run-off and erosion, and to cause severe seedling losses through drought. The density must not be reduced below 0·5, and selection fellings are the correct treatment. In type (2) the Pine is accompanied by *Picea orientalis* (often forming a second storey), *Abies nordmanniana*, *Populus tremula* and *Betula*; the underwood and ground vegetation, varying much in amount with stand density, consist of *Lonicera caucasica*, *Cytisus caucasica*, *Sanicula*, *Festuca*, *Viola*, *Rubus* and mosses. Conditions for Pine regeneration are generally good and it is chiefly when group fellings have been made among trees too young to bear seed, and where fellings did not coincide with a seed year, that failures have occurred. Group-selection felling in two stages is recommended; the first stage must be in a seed year and can reduce the stand density to 0·3–0·4, the Spruce and Fir being felled in preference to the Pine. The groups must be 25–35 m. in diameter to admit the necessary light; slash should be piled and burnt, and the soil scarified. In type (3) the associated species are Spruce, Fir, Birch and Rowan, the underwood is chiefly *Corylus avellana*, and the ground vegetation, of *Festuca* and other grasses, *Salvia* and mosses, is far denser than in the preceding type. At the higher stand densities (0·7–1·0) and in small gaps, Spruce regenerates well, usually excluding Pine regeneration. Successive [uniform?] or selection fellings are possible here, and so long as the density is not reduced to 0·4, there should be good regeneration of Spruce with suitable opportunities for its later replacement by Pine, but the best method is believed to be group-selection with groups 20–25 m. in diam., the slash being scattered over the ground. When satisfactory 5-year-old Pine regeneration has been obtained, the groups must be widened. In type (4) the associated trees are Spruce, Birch and Aspen, the underwood consists of *Cytisus caucasica*, and the ground flora is of xerophytic species. In openings a dense grass cover often develops and prevents regeneration. The *Cytisus* is possibly beneficial as a source of soil N. Good regeneration can be obtained at stand densities of 0·4–0·5. Group selection fellings as in type (2) are appropriate, but there is more risk of drying out, and to reduce this the groups should be elliptical,

with their long axis running N.–S., i.e. approximately along the contour (since the type occurs mainly on E.–N.E. aspects).

1090. BAKER, F. S. **Reproduction of [Ponderosa] Pine on old railroad grades in California.** *J. For.* 49 (8), 1951 (577–8). 1 ref.

Profuse regeneration was observed on the formations of logging railways from which lines and sleepers had been removed, though it was scanty on the adjacent cut-over areas.

1091. BOE, K. N. **Natural regeneration of Lodgepole Pine on seedbeds created by clear cutting and slash disposal.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 99, 1951. p. 1.

Tests on regeneration in relation to slash disposal included spot burning of slash concentrations, dozer piling and burning, lopping and scattering, and no disposal. Results of a seedling count at the end of the first growing season are tabulated. Seedlings were found in abundance on the natural forest floor, on skid roads, on ground scarified by dozer piling, and where the slash was lopped and scattered, but not among concentrated slash or on burned-over ground.

1092. AHMAD, Y. S. **Will Teak regenerate naturally in the Chittagong Hill Tracts.** *Pakistan J. For.* 1 (3), 1951 (271–2).

Teak forests 78 years old are now ready for exploitation. An experimental area has been laid out, in which ⅓ of the trees will be removed every 3rd year. After each felling, all second-storey species, Bamboos, and shrubs, will be cut and burned. It is hoped that this treatment will provide sufficient illumination and freedom from competition, to permit the Teak to regenerate naturally. [Cf. *For. Abstr.* 13 (No. 1102).]

1093. **[Natural regeneration of savanna woodland in Nigeria as affected by fire.]** *Rep. For. Adm. Nigeria 1949/50*, 1951 (17–20).

The beneficial effects of fire exclusion on natural regeneration and densification of savanna woodland has been demonstrated on sample plots, but it is considered impracticable to exclude fire from large areas.

1094. **[Regeneration of *Baikiaea plurijuga*.]** *Rep. For. Dep. S. Rhod. 1950*, 1951 (11).

In Matabeleland an experiment on various methods of regenerating *B. plurijuga* is now beginning to show results. Four different treatments were to be tried, and so far the best rate of growth has been obtained from coppice re-growth thinned to 2–3 shoots per stump, with overhead shade.

1095. **[Burning to obtain regeneration.]** *Rep. For. Dep. N. Rhod. 1949*, 1950 (7).

The chief silvicultural measure adopted for procuring natural regeneration in nearly all the woodlands in N. Rhodesia is intensive early burning. It has been sufficiently demonstrated over the past 16 years that most clear-felled *Isoberlinia* and *Brachystegia* woodlands will restock themselves from coppice and suckers fairly readily, if early burning is done intelligently and is consistently repeated.

1096. **Root-sucker experiment with *Bombax malabaricum*.** *Rep. For. Res. Madhya Pradesh 1948/49*, 1951 (22).

Five trees were felled in each of the months May, June and July, and in each case 4 roots were exposed in different directions at a distance of about 7 ft. from the stump in order to induce suckering. The results are given (*a*) by dates, (*b*) by girth of trees and (*c*) by girth of severed roots. The greatest number of suckers was obtained by felling in June and medium-sized trees suckered more freely than the smaller or larger ones.

1097. ZILLGITT, W. M. **Disking to increase stocking in Aspen stands.** *Tech. Notes Lake St. For. Exp. Sta.* No. 357, 1951. pp. 1.

An Athens-type disk, 6 ft. wide, and a crawler tractor were used to disk 4 understocked Aspen areas in strips some 8–12 ft. apart, at a cost of *ca.* $2.50/acre. The results showing stocking on disked areas and undisked controls are tabulated. Stocking on good sites increased to 11,000 stems/acre. [Cf. *For. Abstr.* 12 (No. 264).]

232. *Artificial Regeneration*

1098. NAVARRO GARNICA, M. Repoblaciones en zonas secas. **[Reforestation in dry areas.]** *Montes, Madrid* 6 (36), 1950 (721–4); 7 (37; 38), 1951 (29–32; 101–6). [Span.]

General recommendations on choice of species, preparation of ground, planting techniques, sowing, transplanting, weeding and tending of plantations.

1099. WAHLENBERG, W. G. **Planting in the Appalachian Spruce-Fir type.** *J. For.* 49 (8), 1951 (569–71). 1 ref.

Re-examination of experimental planting and sowing in logged and burnt sites in the Appalachians confirms earlier reports [cf. *For. Abstr.* 7 (No. 746)]. Direct sowing was a failure. Planted Red Spruce [*Picea rubens*] showed better survival than Red Pine [*Pinus resinosa*], but the Pine showed better growth. Release from competing hardwoods is essential to successful planting. It is recommended that if it is not possible to plant a large proportion of these devastated forests, planting should be confined to compact areas on ridge-tops from which, in due course, adjacent areas can be seeded.

1100. HESMER, H. [Editor.] Die Technik der Kiefernkultur. **[The technique of establishing Scots Pine plantations.]** Verlag M. & H. Schaper, Hannover 1949. pp. viii + 185. 152 refs. [G.]

A symposium on the same lines as that for Spruce [see *For. Abstr.* 13 (No. 198)], with contributions on: development of Pine plantation technique, and methods of formation in relation to economic aim of the stand (costs justified for particular products) (*H. Hesmer*); preparatory work (*E. Pfort*); strip cultivation—methods and equipment (*H. Hesmer* and *H. H. Hilf*); full cultivation—methods and equipment (*H. Lubisch* and *E. Pfort*); manuring (*R. B. Hilf*); regeneration in combination with agricultural crops (*W. Hassenkamp*); sowing and planting (*H. H. Hilf*); early tending (weeding etc.) and protective measures (*E. Pfort*). Includes also

a list of manufacturers and agents supplying equipment and chemicals, and a subject index.

1101. HUGUET, L., and MARIE, E. Les plantations d'acajou d'Amérique des Antilles françaises. **[The Mahogany [*Swietenia macrophylla*] plantations in the French West Indies.]** *Bois For. Trop.* No. 17, 1951 (12–25). [F.e.span.]

Establishment, protection, increment and yield of plantations in Martinique and Guadeloupe.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 916, 1172, 1183–7, 1190, 1195–6, 1215, 1218–20, 1230–2, 1245, 1299, 1785.

1102. GHANI, Q. **Some problems in the working of the evergreen and semi-evergreen forests of East Bengal.** *Pakistan J. For.* 1 (3), 1951 (204–8).

Discusses (1) difficulties of extraction and utilization for the evergreen and semi-evergreen forests of Chittagong and the Chittagong Hill Tracts, and (2) possible disadvantages in the present policy of planting felled areas in this region with Teak, both because of the danger of provoking laterization and/or erosion of the soil by substituting deciduous for evergreen cover, and because of the trend towards using more wood as pulp, plywood and fibreboard and less as sawtimber. [Cf. *For. Abstr.* 13 (No. 1092).]

232.11. *Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.*

See also Nos. 996, 1013, 1182–4, 1757.

1103. KERMANI, W. A. **Exotic trees in East Pakistan.** *Pakistan J. For.* 1 (3), 1951 (273–9).

Notes on the performance of *Tectona grandis*, *Swietenia macrophylla*, *Xylia dolabriformis*, and *Pterocarpus dalbergioides*.

1104. MAHATADZE, L. B. O kuljture berezy v Armenii. **[Birch plantations in [Soviet] Armenia.]** *Lesn. Hoz.* 1950 (5), (87–8). [Russ.]

Birches (*Betula* [*verrucosa*?] and *B. litwinowii*) occur naturally—most often in mixture together and with hybrid forms—as small scattered stands at 1,900–2,300 m. near the upper timberline in Soviet Armenia. Isolated trees are found as far down as 1,800 m. Natural regeneration is good to excellent. In the lower forest and steppe zones there is no natural Birch, though trials both in botanical gardens and in field conditions have shown that 3- to 4-year-old wildings from the subalpine forests can be planted with success. Attempts to raise seedlings at the lower elevations have failed, a fact which is attributed to the high temperatures, low humidity and almost zero rainfall of September/October, resulting in the seed's drying out before it can germinate. In the subalpine zone, regeneration succeeds on account of the frequent fogs and dews. The success of plantations of wildings at Kirovakan (1,300–1,500 m.) and elsewhere in steppe climates, suggests that Birch should be much more widely employed in steppe afforestation, and has created an increasing demand for Birch wildings.

1105. MALJCEV, M. P. Lesnye kuljtury v Beštaugorskom lesnom massive. **[Tree plantations in the forests of the Beshtau Mts.]** *Lesn. Hoz.* 1950 (5), (37–42). [Russ.]

Briefly describes the composition of the forests on the slopes of the mountains Beshtau and Mashuk, Stavropol region, in the forest-steppe zone of the northern Caucasus. The chief tree species are Ash (*Fraxinus excelsior*), Hornbeam [*Carpinus betulus*?], Oak (*Quercus robur* at lower, and *Q. sessiliflora* at higher levels) and Beech [*Fagus sylvatica*?]. Mixed with these are various other hardwoods, mainly species of *Acer*, *Tilia*, and *Ulmus*. Ash, which occurs mostly on N.W.–N.E. aspects, is the dominant with the largest aggregate area. Next in extent is Oak, generally on sunny S.W.–S.E. aspects and showing the best growth on the deeper, richer soils, though it will also form stands, of lower quality, on the thin, dry soils at higher elevations. This species formerly occupied a larger area, but has decreased owing to successful competition on the part of Ash, and to past fellings. Hornbeam is dominant chiefly on cool northern slopes; on similar but better sites it is displaced by Beech.

About ⅓ of the area of these forests is on steep slopes, dissected by deep ravines with considerably eroded skeletal soils; their protective functions are extremely important, and so, consequently, is the question of artificial regeneration, where necessary. The author gives some account of plantations made in the 1890's, with growth data and, for Ash and *Gleditsia* [*triacanthos*?], diagrams of root systems. Pure Oak has done well except for some glaze damage, which has been severe in open but much less so in closed stands. Ash/Oak in 50/50 tree-by-tree mixture has not succeeded, the Ash seriously suppressing the Oak to the point where the ultimate result must be pure Ash. If this mixture is to succeed, the two species must be planted in pure groups. Pure Ash has been successful, and though its growth and quality decrease with increasing elevation and gradient, it will grow on shallow, stony soils where its root system, as developed under these conditions (strong superficial radiating laterals and several thick vertical roots penetrating deep into the subsoil and capable of maintaining a water supply in dry periods), is well adapted to fix steep eroded slopes. On gradual northern slopes with rich, moist soil, *Gleditsia* has been superior to Ash in growth and stem form, but on dry, steep slopes with thin skeletal soils it is inferior.

In the past 15 years there has been some interest in conifers, especially Pines, which do best on gradual slopes with fresh, rather deep soils. Young plantations of Crimean [*P. pallasiana*] and 'Caucasian' [*P. eldarica*?] Pines show some promise, but in pure stands the fire risk is high, and they should be tried in mixture with hardwoods.

1106. MOONEY, O. V. ***Cedrus deodara* at Glengarra.** *Irish For.* 8 (1), 1951 (3–7), 6 refs.

Note on a stand at Glengarra in Tipperary. Measurements made when the trees were (judging by increment borings) 67 years old gave the following results: stems/acre 160, quarter-girth b.h. (of mean-basal-area tree) 14·5 in.; total height (mean-basal-area tree) 68 ft.; height to 6 in. diameter 48 ft.; mid quarter-girth 10·5 in.; volume/acre 4762·8 cu. ft. Hoppus; m.a.i. 71·08 cu. ft. Hoppus. A fine crop of cones is borne in favourable years.

1107. CLEAR, T. **Douglas Fir in Co. Wicklow.** *Irish For.* 8 (1), 1951 (8–18).

Growth statistics for several plantations lead to the conclusion that even under fairly good conditions Douglas Fir is not likely to be a very heavy yielder on the foothills of Co. Wicklow, but that it is much superior in growth rate to the usual alternatives, European Larch and Scots Pine. It is inferior in height growth to Japanese Larch in the early stages, but promises to give a better quality of timber, and stem analysis indicates that increment is well maintained between 20 and 30 years when that of Japanese Larch tends to fall off. Early thinning, starting at the 15th year after planting, and reduction of number to 400–500 stems/acre by the 20th year, seem to be necessary if increment is to be maintained.

1108. WRABER, M. Tuje drevesne vrste v naših gozdovih. **[Foreign tree species in our forests.]** *Gozd. Vestn.* 9 (4), 1951 (94–103). [Slovene.]

The first exotics were introduced into Slovenia in 1880–90. In 1926 there were in the provinces of Ljubljana and Maribor 113 ha. of forests of exotic species (96 ha. conifers, 17 ha. hardwoods; *Pinus strobus* 46 ha., *Pseudotsuga taxifolia* var. *viridis* 16 ha *Populus* '*canadensis*' 11 ha., and *Quercus rubra* [*Q. borealis*?] 3·3 ha.). No statistical data are available for the period 1936–50. A 7-year-old pure Douglas-Fir stand in Pohorje showed in 1949 an average height increment of 1 m. (max. 1·68 m.). Pure stands show annually a volume increment of *ca.* 30 cu.m./ha. Douglas Fir grows in Slovenia at the 500–1,000 m. level. Forty-year-old trees reach a height of 25–30 m., and a d.b.h. of 45–50 cm. Branchy growth is unfortunately common. They do not suffer from insect pests, though some fungus diseases are imported along with the trees. Other exotic species briefly reported on include: *Pinus strobus*, reaching a height of 20–28 m. and a d.b.h. of 35–40 cm. at 30 years; *Abies nordmanniana* (in parks); *Abies grandis* (in 1 place); *Abies concolor* (parks); *Picea sitchensis* (2 places); *Picea pungens* (parks); *Chamaecyparis lawsoniana* (2 places); *Tsuga canadensis*; *Tsuga heterophylla* (1 place, and parks); *Taxodium distichum* (rare); *Picea omorika*; *Pinus cembra*; *Larix leptolepis*; *Quercus rubra* [*Q. borealis*?]; *Quercus palustris* (1 place); *Quercus macrocarpa*; *Juglans nigra*; *Fraxinus americana*; and *Populus* '*canadensis*'.

1109. ZIMMERLE, H., and LINCK, O. Versuchsanbauten fremdländischer Holzarten im Württ. Forstbezirk Güglingen. **[Trials of exotic species in the Güglingen forest district of Wurtemberg.]** *Forstwiss. Cbl.* 70 (5), 1951 (310–9). [G.g.]

Notes on the development of exotic conifers in Güglingen forest district. Most of the plantations vary between 13 and 23 years of age, and the trial plots range in size from 0·10 to 0·75 ha. The following species are under trial: *Pinus excelsa*, *P. strobus*, *P. jeffreyi*, *P. peuce*, *P. pinaster*, *P. nigra* var. *calabrica*, *P. nigra* var. *austriaca*, *P. contorta*, *P. contorta* var. *latifolia*, *Chamaecyparis lawsoniana*, *Thuja gigantea*, *Picea omorika*, *P. abies*, *Abies grandis* and *A. concolor* var. *lowiana*.

1110. HENNIG, R. Fremdländische Holzarten im deutschen Walde. **[Exotic tree species in German forests.]** *Weltholzw.* 3 (4/5), 1951 (84–7). 10 refs. [G.] P.R.

A review, including a chronological table showing dates of introduction of 20 species into Germany (all except two, from N. America).

1111. QUEIROZ, J. DE B. RODRIGUES. Ensaio sobre a cultura dos pinheiros no Planalto da Huíla. **[Pine cultivation trials on the Huíla plateau.]** *Agron. angol.* No. 3, 1950 (111–9). [Port.f.e.]

Reports on nursery and arboretum trials with exotic Pines, the seeds of which were imported in 1941, and tried out by the Humpata Agricultural Station. To date the most promising species are *Pinus patula*, *P. radiata*, *P. khasya* and *P. halepensis*. *P. muricata*, *P. taeda* and *P. caribaea* are less promising.

1112. CHISMAN, H. H., and BRAMBLE, W. C. **Banks Pine [*Pinus banksiana*] in Pennsylvania.** *Bull. Pa. agric. Exp. Sta.* No. 538, 1951. pp. 16. 6 refs.

Silviculture and yield of plantations. An examination of representative stands *ca.* 30 years old indicated that they had grown at a reasonable rate compared with native Pines or with *P. banksiana* in its natural range.

1113. STOEHR, H. A. **Growth and yields from a fifty-year-old White Pine plantation.** *Quart. Bull. Mich. agric. Exp. Sta.* 33 (4), 1951 (426–36). 8 refs.

Gives in graphs and tables, figures for the Beal Pinetum, a 3-acre stand established in 1896 at East Lansing. In 1950, the stand averaged 13·2 in. in diameter and 78 ft. in height and contained 16,500 bd. ft./acre.

1114. BURGOS, J. C. Los pinos cultivados en Mendoza. **[The Pines cultivated in Mendoza.]** *Rev. argent. Agron.* 17 (1), 1950 (14–29). 15 refs. [Span.] E.M.B.

Botanical descriptions and silvicultural characteristics of the many species of Pine found in the north of the province, with notes on wood properties.

1115. **Growth of old Eucalyptus continues rapid in the mountains.** *Carib. For.* 12 (1), 1951 (12, 30). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11, [1950?].)

Although most *Eucalyptus* does not thrive at low levels in Puerto Rico, a 25-year-old stand of *E. robusta* growing at about 2,000 ft. altitude where annual rainfall is *ca.* 100 in. and mean temperature *ca.* 72° F., has made rapid and sustained growth, in spite of the fact that the plantation is growing on poor lateritic clay, adverse to most tree species.

232.12. *Races and Provenance Trials*

See also Nos. 1122, 1282, 1322.

1116. WOOD, R. F., and PINCHIN, R. D. **Provenance studies.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (48–55).

In Beech trials, planted in 1942 at Savernake Forest and in Abbotswood (Forest of Dean), a Dutch lot and a lot from West Dean (Sussex) lead in vigour, and both show, so far, a low % of forking.

The Nagshead (Forest of Dean) plants are, as usual, the worst in both growth and form.

Scots Pine trials in Thetford Forest, 17–18 years old, have had their first thinning, and an estimate of crop volume and increment has been possible. The Finnish and Norwegian lots and one Scottish race (Glenmoriston) come out lowest, followed by Riga (Latvia) and Trentino (Italy). The best races for vigour were from Sopron (Hungary) and Kassel (Germany), closely followed by East Anglia, and Wangenbourg (France). The best Scottish origin was considerably lower. In height growth, the East Anglian race came out ahead. The best Scots Pine origin (Sopron, Hungary) had, at this stage, only about ⅓ of the volume production of Corsican Pine on similar sites. Reports on the provenance experiments with Corsican Pine, Maritime Pine and Larch are included.

1117. PAVARI, A. Esperienze e indagini su le provenienze e razze dell'abete bianco (*Abies alba* Mill.). **[Experiments and investigations on provenances and races of *Abies alba*.]** *Pubbl. Staz. sper. Selv. Firenze* No. 8, 1951. pp. 96 + 15 plates. 33 refs. [It.it.e.] (*Repr.* from *Nuovo G. bot. ital.* (*n.s.*) 1951.)

Data and results of trials of 20 lots of *A. alba* seed from 14 Italian and 6 foreign (Austrian and French) provenances, started in 1925 at Vallombrosa. Best results were obtained from seed of Calabrian origin, closely followed by that of local origin, but interrupted experiments at a higher altitude in the High Parma valley indicated that seed of southern provenance was not adapted to such a cold climate. A further study was made of the ecology of the habitats of 17 of the strains used in these experiments, the natural regeneration and penetration of *A. alba* in broadleaved stands, and its relation to light, moisture, and temperature. The race of the central-southern Apennines shows considerable drought resistance and greater sensitivity to a continental climate, compared with the Alpine and northern races, but is not morphologically distinct.

1118. BECKING, J. H. De Douglas-bossen van de Pacific North West. **[The Douglas-Fir forests of the Pacific North West.]** *Ned. Boschb.-Tijdschr.* 23 (2; 7/8), 1951 (35–50; 193–209). [Du.]

Gives statistics for the region, discusses the plant associations and natural regeneration and gives comparative figures for Douglas Fir from different provenances in the Netherlands.

1119. POSKIN, A. Le Douglas ou sapin de Douglas (*Pseudotsuga taxifolia* Britt. = *Ps. Douglasii* Carr.) sa culture en Belgique. **[The silviculture of Douglas Fir in Belgium.]** *Bull. Soc. for. Belg.* 58 (9), 1951 (329–66). 20 refs. [F.]

Report of a committee of the Conseil supérieur des Forêts. Green Douglas (*P. taxifolia* var. *viridis*) is the form best suited to Belgian conditions and it is recommended that research should be continued in the varieties of this form. The chief dangers to Douglas Fir are excessive dryness of the atmosphere, which provokes physiological drought, and spring frosts. It is recommended that the danger of fungus diseases should be diminished by planting this species in a mixture with broadleaved trees. Data on increment and yield of a number of plantations are given.

1120. BRODOVIČ, T. M. Zelenaja duglasija v kuljturah USSR. **['Green' Douglas Fir in plantations in the Ukrainian S.S.R.]** *Lesn. Hoz.* 1950 (5), (43–5). [Russ.russ.]

Gives some growth figures for 'green' Douglas Fir in the western part of the Ukrainian S.S.R., where this species combines fast growth (yield as high as that in its native habitat) with frost resistance and high wood quality, and concludes that it merits much wider use in W. Ukrainian and White Russian plantations. All the existing plots should be reserved for seed production.

1121. KIELLANDER, C. L. Sortskillnader i 10-åriga fältförsök med svensk och mellaneuropeisk gran. **[Differences between individual tree progenies in a 10-year field experiment with Swedish and Central European Spruce.]** *Årsberätt. Fören. Växtförädl. Skogsträd 1950*, 1951 (30–49). 18 refs. [Sw.] Also in *Svenska SkogsvFören. Tidskr.* 49 (3), 1951 (282–301).

Seed collected during 1940–1 from 14 stands (2 of which were of German provenance) in different parts of Sweden, was used for provenance trials at Ekebo and Knutstorp in Skåne (16 trees each) and at Strömsrum in Småland (30 trees). Tree heights were measured at 4 years in the nursery, and heights and diameters ½-way up the stem at 10 years. Significant differences between the heights of provenances at 4 years were strongly correlated with differences at 10 years old. At the latter age, height and diameter at half height were also strongly correlated. In all three trials, the tree heights were on average greater for the German Spruce, the figures for the German Spruce at Ekebo, Knutstorp and Strömsrum being respectively 23·1, 20·8 and 57·0 % above the average height for Swedish Spruce. The exceptionally large difference at Strömsrum, where spring frosts are frequent and the autumns are warm, is due to the later growth period of the German Spruce. The plot of Swedish Spruce here was thin, of poor quality and of slow growth. Certain of the trees have been noted as suitable parent trees, because of their fast growth and resistance to spring frost. Literature relating to the northern limit for German Spruce in Sweden is discussed and the author suggests that it may safely be grown throughout Götaland and in suitable districts of Jönköping.

232.13. *Trials of Hybrids and Other Products of Tree Breeding*

See also Nos. 953 *et seq.*

1122. JOHNSSON, H. Avkommeprövning av björk—preliminära resultat från unga försöksplanteringar. **[Progeny trials of Birch—preliminary results from young experimental plantings.]** *Svensk PappTidn.* 54 (11; 12), 1951 (379–93; 412–26). 18 refs. [Sw.sw.e.] (*Medd. Fören. Växtförädl. Skogsträd* No. 55.) P.R.

Trial plots comprising a total of 46,869 trees were established between 1942 and 1948. In a comparison between different species, *B. lutea* showed the lowest height, diameter and volume growth and the highest

mortality, *B. pubescens* showed better results, and the growth of *B. papyrifera* and *B. verrucosa* was good; the two latter differed little in rate of growth, but *B. papyrifera* was inferior in quality, having heavy branches and crooked stems. In experiments begun in 1943, pure species and hybrids were compared. During the early years there were considerable differences in height and diameter growth, but these tended to disappear. Differences in volume remained large and the following volumes in cu.m./ha. were obtained in 1950: *B. verrucosa* × *B. japonica*, 73·9; *B. papyrifera* 59·3; *B. pubescens* × *B. papyrifera* 55·4; *B. verrucosa* × *B. papyrifera* 48·5; *B. verrucosa* 35.7; *B. pubescens* 34.2. The form of *B. papyrifera* was again inferior. In 11 experiments, some 280 progenies of *B. verrucosa* and *B. pubescens* from different parts of Sweden (between 55° 50′ and 66° 20′ N. latitude) were compared. The test plantations were at about latitude 56°. The geographical origin of the progenies proved to be the most important source of variation, and height growth decreased regularly from the most southern to the most northern progenies. In two experiments, controlled crosses within the species *B. pubescens* and *B. verrucosa* were compared. In the first, comprising *B. pubescens* from different parts of Sweden, growth was better from progenies with parents of southern origin. In the second, begun in 1947, comprising progenies of *B. verrucosa* and *B. pubescens* and F_1 *B. japonica* × *B. verrucosa*, no clear results had emerged by 1950. The following conclusions are drawn: (1) Progenies of northern origin grow slowly in southern Sweden, and Birch seed for afforestation should not be harvested in stands more than 100–150 km. north of the proposed planting site. (2) *B. lutea* is rather too slow-growing for use in Sweden. (3) *B. papyrifera* is fast-growing but inferior in form; its hybrids with *B. verrucosa* and *B. pubescens* are fast-growing and of better form. (4) *B. verrucosa* × *B. japonica* is fast growing and satisfactory in form; its production on a large scale for afforestation is considered desirable The technique of progeny trials is discussed. Results are given in graphs and tables, and there is a full English summary.

1123. Johnsson, H. Avkommor av masurbjörk. **[Progeny of Curly Birch.]** *Svenska SkogsvFören. Tidskr.* 49 (1), 1951 (34–45). 3 refs. [Sw.] Also in *Årsberätt. Fören. Växtförädl. Skogsträd 1950*, 1951 (18–29).

In the first experiment, seed was collected in 1940 after free seeding from 12 Curly Birches of different provenance grown at Ekebo. The trees were planted out in 1943, and examined at 8 and at 10 years. Of the original 1,800 plants, 1,449 remained in 1950. By 1948, 281 and by 1950, 384 were distinguishable as curly trees. The degree of curliness varied considerably between the different trees. In the second experiment, seed was collected after controlled crossing. Only 383 of the original 600 plants survived. The first cross was between 2 normal trees and no curly trees resulted. Crosses between curly trees gave a high proportion of curly progeny, 53·8, 61·8 and 44·7%. Height measurements for normal and curly trees are tabulated, and show that curly trees are slower growing. A 50% mixture of normal and curly trees at 1·5 × 1·5 m. spacing is recommended as encouraging better height growth and reducing branching of curly trees. The normal trees should be removed in thinnings.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 1048, 1172–3, 1175, 1179–80, 1191, 1222, 1317–8.

1124. Beard, J. S., and Darby, G. D. **An experiment on burning in Wattle silviculture.** *J. S. Afr. For. Ass.* No. 20, 1951 (53–77 + 4 photos). 8 refs. [E.e.]

[Cf. *For. Abstr.* 12 (No. 261).] The history of an experiment laid down in 1928 and carried on till the present time is detailed. There were three pairs of plots, alternately burnt and not burnt at the time of re-establishment. The second cycle of trees on the experiment was concluded early in 1950, when measurements of the mature crop disclosed no effective difference between treatments in diameter, height, bark thickness or disease incidence. Similarly, bark yields and analysis showed no differences of any importance. It is concluded that burning as a silvicultural practice with Wattles has no effect on the quality of mature crops.

In order to discover whether any degradation of soil fertility is liable to occur as a result of burning the brushwood and litter in the cultivation of wattle soils, samples from 'burnt' and 'unburnt' experimental plots were investigated for:—(*a*) humus content, (*b*) water-holding capacity, (*c*) hygroscopic moisture and (*d*) pH.

The results are discussed, and, since no differences were found in (*a*), (*b*) and (*c*), and the difference in (*d*) was too small to warrant consideration, it is concluded that there is no loss of fertility as a result of burning brushwood.

Some properties of samples of virgin veld and neighbouring Wattle soils were also investigated and the results are discussed.

The indications are that, although some of the properties have altered, there is no loss of fertility when veld soil is given over to Wattle culture. *Authors' summary.* [Cf. *For. Abstr.* 13 (No. 911).]

1125. **[Soil preparation on hard-pan soils.]** *Rep. For. Dep. Tanganyika 1949*, 1951 (16–7).

The following methods were tested for preparation for direct sowing of very heavy, hard-pan soils which hand hoes cannot touch in the dry season:—(1) ripping in lines 8 ft. apart and 8 in. deep, seed line-sown in roughly broken tilth; (2) as in (1) but with soil removed from ripped lines to form ridges; (3) hand-hoed and tie-ridged; (4) spot sowing, 8 × 8 ft., in patches dug to a depth of 6 in.; (5) whole area ripped 8 in. deep and tie-ridged by hand; (6) as in (5) but spot-sown on the flat; and (7) as in (5) but soil removed to form ridge and trench. Treatments (6) and (7) were done with a D7 Caterpillar and Killefer ripper during a very dry spell, and bottom gear was required. The results for direct sowing of *Cassia siamea* showed that (3) and (5) were best, with (7) only a little inferior. Treatment (4) was a failure, and extra depth of ploughing had no noticeable effect.

1126. STENTZEL. Drei neue Forstpflüge. **[Three new forest ploughs.]** *Forst u. Holz* 6 (15), 1951 (223–5). [G.]

Describes and illustrates: (1) the 'Stehle-Gigant' roller plough, (2) a subsoiling plough with ridging mouldboards, and (3) a plough for complete (as opposed to strip) cultivation. All 3 ploughs were developed by Revierförster Klages.

1127. ESCHMENT. Ein neuer Forstuntergrundpflug. **[A new forest subsoiling plough.]** *Forst u. Holz* 6 (15), 1951 (225). [G.]

The plough, which is illustrated by a diagram, is said to plough at a consistent depth, without leaving air spaces, and to cope satisfactorily with obstacles in the soil.

1128. RENNIE, P. J. **Research into the physical and chemical properties of forest soils.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (116–8). [Imperial Forestry Institute, Oxford.]

Assessment of trial areas late in 1949 demonstrated that failures of Sitka Spruce on deep-ploughed areas were much fewer than on screefed plots. Analysis of failures on screefed plots showed that a larger proportion occurred on areas formerly occupied by *Eriophorum* spp. Flushing was much earlier on deep-ploughed than on screefed plantations.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. *Seed*

232.311. Seed Production (Seed Years, Seed Crops etc.)

See also Nos. 1042, 1045, 1742–3.

1129. SCHALLER, L. D. **Better seed for better trees.** *Pa. For. Wat.* 3 (4), 1951 (76–81, 88). 4 refs.

During 1950 the Pennsylvania Dept. of Forests and Waters initiated a project to discover and reserve for seed production, élite stands of the most important species. The mean annual temperatures of such stands were then determined and a temperature map of the State compiled, from which it is possible to determine the theoretical mean annual temperature of any site, and thus to decide on the best seed source among the established élite stands. The selected stands will be thinned and any inferior trees removed, and seed orchards will be established by planting the best seedlings produced from the élite stands.

232.312. Seed Collection, Extraction and Grading

See also Nos. 1040, 1048, 1136, 1785.

1130. GAVRILOVIĆ, S. Alatka za branje šumskog semena i plodova. **[A tool for collecting forest seeds and fruits.]** Pp. 21–3 in *Tehničke i Laboratoriske Novosti Instituta*, Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1949. [Serb.russ.]

Illustrated description of a new type of shears mounted on a wooden rod *ca.* 1 m. long. The shears are hand-operated, by means of a string and pulley. The latter actuates a [-shaped member, the arms of which are double-edged blades rotating against a fixed edge. A bag is suspended just beneath the cutter, to catch the seeds or fruit.

1131. MAGINI, E. Influenza dell'epoca di raccolta sulle qualità germinative del seme di Pino marittimo. **[The influence of season of collection on the germinative capacity of *Pinus pinaster* seed.]** *Ital. for. mont.* 6 (4), 1951 (202–3). [It.]

Seed is usually collected in winter or spring, when the cones are brown. Experiments made at Florence with seed from green or half-green cones collected in October, gave a rather higher germination % than seed from cones collected in December or the following June.

232.315. Seed Storage and Treatment

See also Nos. 1048, 1135, 1785.

1132. AKAMINE, E. K. **Viability of Hawaiian forest tree seeds in storage at various temperatures and relative humidities.** *Pacific Science, Honolulu* 5 (1), 1951 (36–46). 10 refs. E.M.B.

Tests were made with seed of 7 Hawaiian species. On the whole, their longevity could be best maintained under Hawaiian conditions if the temperature of the storage medium was kept at a lower level than that of the prevailing atmosphere (70–80° F.) and/or if the relative humidity was maintained at a lower level than that of the prevailing atmosphere. The optimum conditions of storage medium for the species studied were as follows:—*Melaleuca leucadendron:* relative humidity (r.h.) of 45% at room temperature, or open storage at 59°. *Tristania conferta:* r.h. of 45% at room temperature, or air-tight storage at 45°. *Syncarpia laurifolia:* r.h. of 45% at 59°. *Araucaria excelsa:* r.h. of 60% at 45°. *Sophora chrysophylla:* open storage at 59°. *Cupressus macrocarpa:* open storage at 45°. *Santalum album:* r.h. of 45% at 45°. *From author's summary.*

232.318. Seed Testing. Germination Tests. Seed Quality.

See also Nos. 1040, 1048–50.

1133. KRSTIĆ, M., and STANKEVIĆ, P. Aparat za deobu i homogenizaciju prosečnih uzoraka semena. **[An apparatus for separating and homogenizing average seed samples.]** Pp. 10–3 in *Tehničke i Laboratoriske Novosti Instituta*, Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1949. [Serb.russ.]

Describes and illustrates an apparatus designed to mix a seed lot uniformly and to deliver for subsequent testing 3 homogeneous seed samples of roughly equal weight. It comprises (1) a hopper with interchangeable funnels having nozzle apertures of 1·5–5·8 cm. for various sizes of seed, mounted slightly excentrically over a mixing and distributing device consisting of (2) a rotating and (3) a stationary receiver, each having 3 equal compartments with vertical side walls. Each compartment of (2) has an outward-sloping bottom with a semicircular aperture (6 cm. diam.) along the circumference plus a slit 0·9 cm. wide along one of the side walls. Seed delivered from the hopper is mixed here and drops through the openings into (3), which has inward-sloping bottoms to its compartments, each of which feeds the seed through a pipe 5 cm. in diam. to a separate canister. The apparatus is driven by an electric motor and the speed of rotation of (2) can be

adjusted by means of a rheostat, to suit the species of seed concerned.

1134. KRSTIĆ, M. Klijalica za seriske analize šumskog semena. **[A germinator for routine analyses of forest seeds.]** Pp. 5–9 in *Tehničke i Laboratoriske Novosti Instituta*, Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1949. [Serb. russ.]

Describes an electrically heated germinating apparatus particularly suited to large seeds. It contains 21 chambers (cells) of *ca.* 22 × 11 cm. area each; means for maintaining constant temperature and good ventilation are provided.

1135. HOLMES, G. D. **Forest tree seed investigations.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (10–2).

Work was continued on chemical staining methods for testing tree seed, using tetrazolium bromide [cf. *For. Abstr.* 12 (No. 1084)]. The results of tests gave a close correlation with germinative capacity as determined by the standard Copenhagen-tank method, and with actual germination results in the nursery. The principal advantage of the chemical method is the fact that a test can be completed in 24 hr. compared with up to 30–40 days for a standard test. Systematic work on the storage of seeds has been begun. Lime and Beech seed were found to store best at low temperatures (5° C.) in moist sand or peat.

1136. KRSTIĆ, M. Morfološke i biometričke pojedinosti fruktifikacija *Picea omorica* Panč.: kvalitet semena. **[Morphological and biometrical characteristics of the cones of *P. omorika*: quality of the seed.]** Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1950. pp. 23 + 3 photos. 10 refs. [Serb.f.]

A detailed study of a sample of cones from the Tara district showed certain regular relationships between the different features. The cones varied in length from 2 to 6 cm. and in breadth from 1 to 2 cm. The wings and the seeds were largest towards the middle of the length of the cone. The seeds varied in dimensions between (length) 1·7 and 3·8; (breadth) 1·1 and 2·0; and thickness 0·5 and 1·4 mm. Qualitative purity, i.e. the proportion of full seeds, was greater for the larger cones; it was estimated at 86% by weight and 81·6% by number. The absolute weight per 1,000 seeds for winged seeds varied with the size of the cone from 1·50 to 4·95 g., average 3·18, and that of de-winged seeds from 1·10 to 4·10, average 2·39. Individual cones weighed from 1·24 to 9·21 and averaged 4·03 g. A kg. contained 248 partly opened cones. The yield of seed increased with the size of the cone. A kg. of cones below 3 cm. in length gave 12·3 g. of seed; between 4 and 5 cm., 23·6 g. Germination of seeds from well developed cones was up to 93·2% and from small cones only 11·2%; the average for cones of all sizes was 45·6%. It diminished with the size of the seed. The seeds began to germinate from the 6th to the 8th day in alternating temperatures; germination continued until the 20th–34th day. When possible, cones of more than 3 cm. in length should be used for seed collection. A standard method for testing germination is proposed and described.

232.32. *Plant Rearing. Nursery Practice*

See also No. 1230.

1137. BENZIAN, B. **A century-old forest nursery in Germany.** *Forestry* 24 (1), 1951 (36–8 + 2 photos). 1 ref.

Describes a visit to the 200-acre forest nursery of Pein and Pein in the district of Halstenbek near Hamburg. Here, on very light, sandy soil, almost continuous tree crops have been grown for about 100 years. All crops except Pines receive a dressing of farmyard manure as well as N, P, and K fertilizers. Lime is applied only once every 7–10 years and the land is then cropped with hardwoods for 2–3 years. Sowing is normally done in April and May, and lining out from July to October of the following year. Single boards with an attached notched metal strip are used for lining out. *From author's summary.*

1138. GRIFFITH, A. L. **Notes on some conifer nurseries in the south and west of the U.S.A.** *E. Afr. agric. J.* 17 (1), 1951 (32–4).

1139. LANE, C. RODRIGUES. Viveiros e processos de repicagem de eucaliptos. **[Eucalyptus nurseries and pricking-out methods.]** *Agron. angol.* No. 3, 1950 (103–10). [Port.f.e.]

Deals with choice of site for nurseries, the preparation of seedbeds, sowing, pricking out and transplanting. Instructions are included for making earthenware pots for pricking out and direct sowing.

1140. EDWARDS, M. V., and HOLMES, G. D. **Experimental work in the nursery.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (12–24).

[Cf. *For. Abstr.* 12 (No. 1092).] Work was continued on the effects of partial soil sterilization in established nurseries. Residual effects of sterilization in the previous year, both by steam and by formalin were found to be marked. An experiment in placing P fertilizers beneath seed drills, which in the previous year gave negligible results, was very successful in increasing the growth of Sitka Spruce seedlings this year, and is to be repeated. In heathland nurseries, work was concentrated on determining how to maintain an optimum level of fertility with minimum cost in fertilizers and composts. Experiments in the application of N in nurseries again indicated that 'flash' (a waste product of plastic-button manufacture) is the best form of N as well as being cheap.

Preliminary results of an experiment in drilling and broadcasting of Sitka Spruce seed at half-standard, standard, double, and quadruple sowing densities, indicate that density above normal produces fewer, shorter, and thinner plants per lb. of seed, and suggest that, at any rate in the first season, the effects of drilling are similar to those of greatly increased density within the drill or band, in both cases the seedlings seem unable to utilize fully the space between the drills. The application of P (mentioned above) more than compensates for this inferiority of drilled to broadcast sowings.

The series of experiments on watering of seedbeds was concluded, the main result being that, under most soil conditions, considerable increases in the

number of usable seedlings are obtained by watering in dry periods, provided that adequate nutrients are available in the soil. The best results were obtained from watering on soils that had received liberal applications of compost.

An experiment was carried out to test the possible phytotoxic effect of applications of benzene hexachloride (BHC) to seedbeds of Japanese Larch for protection against chafer grubs. It showed conclusively that concentration of BHC dust in the neighbourhood of the seed at the time of sowing causes a pronounced depression of germination and growth [cf. *For. Abstr.* 13 (No. 1396)]. A further test to determine the residual effect of BHC on seedbeds of Sitka Spruce, Japanese Larch and Scots Pine 2 years after treatment, showed a reduction of chafer damage, with an appreciable increase of seedling growth and stocking.

Other subjects dealt with in the report are:—the use of aromatic oils as weedkillers; effect of shade on seedbeds; grading of seedlings; and season and date of lining out of seedlings.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 1140, 1149–50.

1141. CROWTHER, E. M. **Sub-committee on nutrition problems in forest nurseries. Summary report on 1949 experiments.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (97–105).

In seedbed experiments in which composts and bulky organic manures were compared with artificial fertilizers, markedly poorer stands of seedlings were obtained in the compost-treated beds. This was a reflection of the drought effect in a particularly dry season in soils lightened in texture by bulky organic manures, and confirms experience in similar experiments done by the Research Branch. Soil acidification experiments have provided useful information on the degree of damage to be expected when sowing follows application of acid at too short an interval. Where an adequate period elapsed between acidification and sowing, improved growth of seedlings was obtained in Kennington nursery (near Oxford) and at Ampthill nursery (Bedfordshire).

In transplanting experiments, it was confirmed that there was no apparent advantage (in respect of growth and survival of plants) in raising them in compost-treated seedbeds as compared with artificials; plants of equal size raised with artificial fertilizers in the nursery, grew just as well, both as transplants and in the forest. A positive response of Sitka Spruce to phosphate was consistent in all four forests where the experiments were done. Scots Pine did not behave so regularly, and was even reduced in growth by applications of phosphate at King's Forest (East Anglia). Nitrogen, as might be expected in a drought year, depressed growth of both Sitka Spruce and Scots Pine. Trials of fertilizers in the form of pellets, with the object of reducing the speed of diffusion and prolonging the time of action, and also reducing the risk of damage to roots during periods of unfavourable weather, did not achieve the first object, as the soluble nutrients dissolved out of the core of gypsum much faster than had been hoped.

1142. WARCUP, J. H. **The effect of partial sterilisation on the occurrence of fungi in the soil.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (107–10). [School of Botany, Cambridge University.]

Partial soil sterilization, by steam and by formalin, was carried out at Ampthill Nursery, Bedfordshire, and the response of Sitka Spruce seedlings to the treatment was very great. Before treatment, the soils were found to contain more than 100 species of fungus. In the steamed plots all fungi were killed down to a depth of *ca.* 12 in., and in the formalin-treated plots down to 4 or 6 in. Re-infection started from the surface after some 6 weeks in the steamed, and 9 weeks in the formalin-treated plots. Re-infection was mainly by *Trichoderma viride* in the latter. In the steamed plots, *Trichoderma* was the commonest species to come in, with *Mortierella* and *Coniothyrium* as associates.

1143. LEVISOHN, I. **Microbiological investigations and work on composts.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (106–7). [Bedford College, London.]

Experiments with composts and root inoculations were carried on, mainly in pot cultures. The objects were not only to study mycorrhizal fungi, but also to analyse the phenomena of haustorial infection so frequently encountered in run-down nurseries. It was found that different organisms varied considerably in their virulence. The behaviour of various soil fungi in breaking down organic matter in composts was also investigated. Experiments have been started to determine the effect of non-infective filtrates from mycorrhizal pot cultures on the growth of seedlings of the same species in sterile soil.

232.323. Sowing and Covering

See also No. 1140.

1144. MCNULTY, M. E. **Nursery mechanization.** *Irish For.* 8 (1), 1951 (19–20).

Comparative figures of weeding costs and yields are given for broadcast sowing and drilling in the Tair Onen forest nursery. The 'Macslat' multiple seed-saving drill was evolved at this nursery. It is worked on the endless-belt system with a density control, and simultaneously sows 8 drills 4 in. apart. The machine, which costs about £55 to construct, is manually operated. It opens the drills, sows the seed, and covers with grit, in one operation. Drilled beds need only $\frac{1}{5}$ the amount of manual weeding done on broadcast beds, the other $\frac{4}{5}$ being done by hoeing. Drill seedlings also made more height growth in the first year. The constant hoeing gives better retention of moisture.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See Nos. 1140, 1171–2.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 1048, 1140, 1144, 1157.

1145. SRIVASTAVA, T. N. **The application of selective herbicides to forestry practice.** *Indian For.* 77 (3), 1951 (176–91 + 4 plates).

A number of possible herbicides were tested on pot cultures of Scots Pine, Sitka Spruce and Japanese Larch:—NH_4 sulphamate, NaSCN, ammonium D.N.B.P., Na pentachlorophenate, KEt xanthate, Na M.C.P.A., Na 2,4-D, Na 2,4,5,-T, Esso vaporizing oil, Regent vaporizing oil, Shell T.P. 711, Anglo-Iranian white spirit W8/72, Varsol, Diesel oil, and extracts W8/395, W8/409, W8/404 and Shell H-10, diluted with odourless kerosene. Three oils, Shell T.P. 711, Anglo-Iranian white spirit W8/72, and Varsol, were effective against weeds, and having apparently low toxicity to the 3 coniferous species, were further tested on seedbeds. All three appeared to be harmless to seedlings of the species tested when used at rates of up to 70 gal./acre. At 100 gal./acre, Varsol caused 25–30% mortality of Larch and Sitka, and Shell 25–30% mortality of Scots Pine. It is therefore considered that these oils can safely be used with these species, though applications above 70 gal./acre may do slight harm. Preliminary work on the effect of Na M.C.P.A., Na 2,4-D, Na 2,4,5-T and isopropyl-phenyl-carbamate on the germination of 9 *Pinus* spp., *Acacia catechu* and *A. modesta* is also described.

1146. Bouvarel, P. Le désherbage chimique des pépinières. [**Chemical weed control in nurseries.**] *Rev. for. franç.* 1951 (7/8), (525–7). [F.]

Reports on experiments in conifer nurseries at Les Barres and Nancy in the use of petroleum products, 'Désherbant W' and 'Désherbant Carottes No. 35', the latter of which is designed for use on carrots since it has no effect on Umbelliferae. Firs, Spruces, and Pines suffered no injury; Douglas Fir, Larches and *Thuja plicata* suffered slight burning. With the exception of groundsel and umbelliferous species, all weeds including grasses were killed if sprayed during 8–15 days after emergence. Most species become resistant as they grow older. Dosage recommended is 4–6 litres/are, to be applied in fine weather.

1147. Lekander, J. Ogräsbekämpning med oljederivat i plantskolor för tall och gran. [**Control of weeds with oil derivatives in nurseries for Pine and Spruce.**] *Från skogsvårdstyrelsernas arbetsfält* pp. 1–4. [Sw.] *Suppl.* to *Svenska SkogsvFören. Tidskr.* 49 (1), 1951.

Experiments with a hand spray were made using Shell Weedkiller 10 at a rate of 1 litre to 10 sq. m. Results were generally good but couch grass and *Equisetum* spp. were very resistant to the spray. The young conifers (1–4 years) were undamaged or only slightly damaged by the spray in the spring and after about mid-August, but were damaged by a single treatment once the young shoots had appeared. Spraying of 3-year-old Spruce, keeping the nozzle very low, gave good control of weeds, as long as they were not too tall, without damaging the trees, even during the summer.

232.327. Protection Measures in Nurseries

See also Nos. 1140, 1322.

1148. Barnard, R. C. **Forest nursery surface soil temperatures.** *Malay. Forester* 14 (3), 1951 (157–9).

Measurements were made in the nursery under different types of cover: (A) no shade; (B) *atap* (palm thatch) raised 3 ft. above bed at S. edge, sloping to 2 ft.; (C) Bamboo slats giving 50% shade; (D) no shade, but 1 in. of coir dust spread over bed, and also in plantations under natural shade. The results show that the daily mean temperature range of surface soil under plantation cover (2·8° and 2·6° in the two test plots) where germination and early development of seedlings are excellent, is considerably less than in the nursery. (B) resulted in the least range (7·0°), (A) in a range of 20·6°. The effect of (D) was less than that of (C).

1149. Ankudinov, A. M. Pričiny otpada sejancev v lesopitomnikah i mery borjby s nim. [**Causes of seedling mortality in forest nurseries and measures for controlling them.**] *Lesn. Hoz.* 1950 (5), (26–30). [Russ.]

Reports on an analysis made in 1949 by the All-Union Forestry Research Institute (VNIILH) of seedling mortality in 30 nurseries in S.E. Russia, listing the main causes as damping-off and wilts, drying up of seedlings due mainly to non-parasitic causes, injury to leaves by excessive insolation, and parasitic leaf diseases. Damping-off and wilts caused the greatest losses, especially of Pine and Larch seedlings. *Fusarium* spp. were chiefly responsible for damping-off, and, more rarely, *Alternaria*. Formalin treatments of the soil, either just after sowing or after the emergence of Pine seedlings, were relatively ineffective. Among deciduous species the chief loss was due to non-parasitic agencies (sun-scorch, drought etc.). Damping-off caused by *Fusarium* was commonest in *Acer tataricum*, *A. platanoides* and *Euonymus*, less so in *Ulmus*, *Amorpha fruticosa* and *Morus*, and rare in *Fraxinus* and *Caragana arborescens* seedlings. Preventive measures recommended are: (1) Against soil fungi: On chernozems, soil treatment some 5 days before sowing, with H_2SO_4 (30 c.c. conc. acid/sq. m. for sandy soils, and 60 c.c. for loams, diluted in both cases in 6–12 litres of water, according to the moisture content of the soil). For alkali soils, where acid treatment cannot be used, formalin may be tried. (2) Steam sterilization of the soil, against any injurious soil organisms. (3) For conifers, lightening of heavy soils with sand. (4) Treatments to hasten germination. (5) Windbreak fences or hedges round nurseries as a protection against drought, dry winds and sand blowing. Mulching and shading, especially for species with small seed. (5) Good sanitation in and round nurseries: removal of rubbish etc. that may harbour infection. (6) Careful tending (watering etc.) of seedling beds.

1150. Maki, T. E., and Henry, B. W. **Root-rot control and soil improvement at the Ashe forest nursery.** *Occ. Pap. Sth. For. Exp. Sta.* No. 119, 1951. pp. 23.

Describes a 3-year study on *ca.* 110 standard nursery plots in the Ashe nursery, where root rot, of undetermined origin but apparently associated with a nematode/fungus complex, has caused serious losses of Southern Pine seedlings. Treatment with ethylene dibromide ($BrCH_2.CH_2Br$) in a 20% solution at the rate of 30–32 gal./acre gave excellent

control; autumn sowing (of Longleaf Pine), and the application of sawdust at the rate of 20 tons/acre (giving a 1-in. layer), both reduced the occurrence of the disease. The Ashe soils were found to be deficient in organic matter and P. The addition of sawdust, and of NH_4NO_3 at a rate of 300–600 lb., 20% superphosphate at a rate of 3,000 lb., and 50% KCl at a rate of 240 lb. per acre (the minerals to be applied annually and the sawdust triennially), are recommended to ensure production of seedlings of satisfactory size and vigour.

232.328. Vegetative Propagation

See also No. 953.

1151. RUNQUIST, E., and STEFANSSON, E. Sticklingförökning av gran och tall. [**Propagation of Spruce and Pine by cuttings.**] *Svenska Skogsv-Fören. Tidskr.* 49 (1), 1951 (46–66). 26 refs. [Sw.]

In a series of greenhouse experiments with cuttings of Spruce, the following results were obtained: (1) Cuttings taken on 1st December rooted better (17·4%) than those taken on 11 November (5·9%) while those of 14 September failed to root. (2) Cuttings in the range 5–8·5 cm. in length rooted better than those between 10 and 15 cm. (3) Cuttings from the lower ⅓ of the crown failed to root; of cuttings from the middle ⅓, 5·8% of untreated and 3·3 and 2·0% of those treated with different concentrations of indolyl-butyric acid, rooted. (4) In a series of experiments with cuttings treated with this acid or commercial rooting substances and untreated controls, the controls rooted best and cuttings treated with a high concentration of Hortomone A least well. Other cuttings from plus (*p*), average (*a*) and minus (*m*) trees were treated with indolyl-butyric acid or left untreated; 71·4% of the untreated (*p*) cuttings, and of the treated (*p*), (*a*) and (*m*) cuttings rooted, while the figures for the untreated (*a*) and (*m*) cuttings were 58·9 and 41·0% respectively. The root quantity (number of roots × root length) was greater for the treated cuttings of each quality group. A large number of greenhouse experiments on Pine gave generally rather inconclusive results. They showed, however, that: (1) fresh, finely divided sphagnum moss is a better rooting medium than a mixture of peat and sand; (2) lateral shoots root better than terminal ones; (3) cuttings from young trees root better than those from older trees, and slightly lignified cuttings better than either very soft or very woody ones. The effect of rooting substances is not clear; in some experiments rooting appeared to be reduced or at least not encouraged by treatment, and in others it was stimulated. The results are tabulated.

1152. ALLSOP, F. **Propagation of *Pinus radiata* D. Don. by means of cuttings. (Interim port.)** *For. Res. Notes N.Z. For. Serv.* 1 (2), 1950 17). 3 refs.

The material used in these experiments was: (1) cuttings from 1st-order branches of 2-year-old trees, (2) epicormic shoots from 2-year-old trees, (3) cut tops of 1-year-old trees, (4) cuttings from 1st-order branches of 5-year-old trees, (5) 2nd-order cuttings from 5-year-old trees, and (6) 2nd-order cuttings from 7-year-old trees. Half the cuttings were heeled and of variable length, and half were cut to a length of *ca.* 6 in. Some cuttings were treated with 'Rootone' (American Chemical Paint Co.). The results are set out in detail. The following tentative conclusions were reached:—*P. radiata* cuttings of the types used will strike successfully. No special care was necessary in (hand) planting but care had to be taken in cultivation between the lines. Wrenching was difficult, particularly in the case of heeled cuttings, because of their variable length, half of which must be in the soil; with unheeled cuttings of uniform length, wrenching was greatly facilitated. The best time to collect cuttings from 5- to 7-year-old trees is when the terminal over-wintering bud has formed. Cuttings from the north (sunny) side of the tree are to be preferred. With 2- to 4-year-old trees, the best cuttings were provided by the first laterals formed in the spring; they are ready for collection by autumn, when they have become woody. Tops cut from 1-year-old seedlings in June (mid-winter) almost all failed; those taken in August struck reasonably well. Transplanting and planting in the field presented no special problems. The variance ratios for effects of Rootone, of heeled vs. unheeled cuttings, and the reaction of Rootone with heeled vs. unheeled cuttings, were just below the level of significance, but there was some indication that Rootone benefited heeled more than unheeled cuttings.

1153. PAWSEY, C. K. **Some observations upon the vegetative reproduction of Monterey Pine.** *Aust. For.* 14 (2), 1951 (90–4 + 1 photo). 1 ref.

Considerable progress has been made at the Mount Burr Research Station in the vegetative propagation of *Pinus radiata* [cf. *For. Abstr.* 11 (No. 2522)]. The present paper deals with further investigation of the characteristics of vegetatively propagated planting stock. It appears that rooted cuttings are more attractive to sheep and rabbits during their first 3–4 years than are seedlings. They begin to produce female conelets at an earlier age than seedlings (quite commonly at 3 years old). During the first 3–4 years the diameter of seedlings is markedly greater than that of cuttings of the same height.

Trees have exhibited so much constancy in relative ability to strike cuttings, as to suggest that this character is inherently controlled. On the evidence of various clones established up to 10 years ago, it would seem that all outward characteristics are controlled genetically, though influenced to varying degrees by the environment. Within each clone (consisting of upward of 20 individuals) there is a striking uniformity in such attributes as vigour, limb size, type of whorling (e.g. uninodal or multinodal, acute-angled or wide-angled branching habit etc.), the nature of bark, length, colour and disposition of the needles, height to crown 'green level', and the size, shape, abundance and distribution of the cones.

What little evidence has yet been gathered encourages the belief that deterioration in vigour is not likely to ensue from repeated vegetative propagation.

1154. VERLEYEN, E. J. B. Le bouturage et les substances de croissance synthétiques (études et

recherches sur l'emploi des substances de croissance synthétiques dans le bouturage en horticulture). [**Vegetative propagation and synthetic growth-regulating substances (studies and experiments in the use of synthetic growth-regulating substances in vegetative propagation for horticultural purposes).**] Fondation Universitaire de Belgique, Antwerp. 1948. pp. 198 + 85 tbls. + 37 plates. Numerous refs. [F.du.g.e. span.pol.port.russ.] E.M.B.

Includes accounts of experiments in rooting cuttings of *Thuja plicata* var. *atrovirens*, *Taxus baccata* and other conifers with (1) β-indolyl-acetic acid and (2) α-naphthalene-acetic acid. Good results were obtained with both these preparations, but (2) was more effective than (1). It was observed that the quantity of solution used has no appreciable effect on the results. The use of strong non-toxic concentrations with a shorter time of uptake proved very effective, but the duration of uptake must be determined as accurately as possible in order to avoid adverse effects.

1155. Boer, S. de. Vermeerdering van de gewassen: proeven met groeistoffen, grondmengsels enz. bij het stekken. [**Propagation of crops: tests with growth substances, soil mixtures etc., when rooting cuttings.**] *Jaarboek, Vereniging 'De Proeftuin' te Boskoop, 1950* [1951] (37–66). [Du.]

The plants from 26 genera on which experiments were made included *Chamaecyparis obtusa nana gracilis*, *Ilex aquifolium pyramidalis*, *I. aquifolium scotica*, *Magnolia denudata*, *M. soulangeana*, *Parrotia persica*, *Picea abies nidiformis*, *P. abies repens*, *P. omori a nana*, *Populus canescens*, *Robinia pseudoacacia*, and *Ulmus carpinifolia* No. 62 'Bea Schwarz'. Results are tabulated.

1156. Bouillenne, R., and Bouillenne-Walrand, M. Considérations scientifiques sur la rhizogenèse chez les houx. [**Scientific considerations on root formation in *Ilex aquifolium*.**] *Lejeunia, Liége* 12, 1948 (75–84 + 3 photos). 9 refs. [F.] P.R.

The formation of roots on fruit-bearing Holly cuttings depends specifically upon internal biochemical factors. The growth regulators applied are rather activators, and only so under optimum conditions. Both sides of the dorsiventral twigs of Holly are qualitatively (and perhaps also quantitatively) equivalent from the point of view of root formation.

1157. Takahara, S. **Studies on the vegetative propagation of some evergreen Oaks by cuttings.** *Bull. Tokyo Univ. For.* No. 32, [1943] (93–114 + 4 photos). 9 refs. [Jap.jap.]

Experiments were made between 1939 and 1941 on 4- to 8-year-old stock of (1) *Q. myrsinaefolia*, (2) *Q. stenophylla*, (3) *Q. glauca* and (4) *Q. acuta*. Cuttings were 1–3 cm. in diameter at the top, and 30 cm. long. The average percentages of rooted cuttings during 3 successive years were (1) 84·76%, (2) 72·38%, (3) 76·19% and (4) 38·75%. *Q. acuta* is thus less suitable for propagating by cuttings than the other three. Oblique cutting gave better results than horizontal. Dipping the lower end of the cutting in 4% glucose solution for 24 hours had no effect on (1) and (2), but improved the results for (3) and (4). No definite results were obtained from treatment with heteroauxin. Cuttings from the bottom of the tree rooted best, and those from the top worst. The best time for taking cuttings is the first 10 days of May. The optimum soil temperature for the planting beds is about 25° C., i.e. they should be partly shaded. Soil with too high a content of organic matter or N is unsuitable. Direct planting out of cuttings is uneconomic; they should be planted in a temporary nursery and then transplanted.

1158. Vicente Arboleda, J., and Serrano, S. Contribución a la propagación con el método de la planta madre. [**Propagation by the 'mother plant' method.**] *Acta Agronómica, Palmira* 1 (1), 1950 (49–50). 5 refs. [Span.span.e.] E.M.B.

Flacourtia ramontchi was treated with a 0·2% α-naphthalene-acetic-acid paste according to Naundorf's method, i.e. the cuttings were treated on the tree before being removed and placed in propagating frames. Treated cuttings rooted 100%, controls only 5%.

1159. Hageman, R. H., and Pagan, C. **The effect of season on the propagation of *Derris* and *Lonchocarpus*.** *Trop. Agriculture, Trin.* 27 (7/12), 1950 (223–4). 3 refs. [Federal Experiment Station, Mayaguez, Puerto Rico.]

Plantings were made in February, May, August and November, of 12-in. woody stem cuttings, which were placed in beds of sand or clay soil in the open at an angle of 45°, and covered to a depth of 10 in. The survival of *Lonchocarpus* cuttings was high at all four planting seasons and best in May.

1160. O uzgoju kanadske topole iz reznica. (Nekoliko prethodnih zapažanja praktičara.) [**Rearing 'Canadian' Poplar from cuttings. (Some preliminary observations of a practical forester.)**] *Šum. List* 74 (12), 1950 (505–8). [Croat.]

Presents some results of observations in the Poplar stool bed of the Usora seed-station nursery (Bosnia-Herzegovina). The stool bed, started in 1946, yielded after one year shoots up to 3 m. high and 3–4 cm. thick. The bed will have to be renewed every 5–6 years. In plantations made with 2-year-old rooted cuttings, it was found that more plants (80%) survived when the shoots were not cut back than when they were cut level with the ground (64%). It was also found that the greater the diameter of the cutting (within the range of classes 7–10, 10–15 and 15–20 mm.) the greater the average height of shoots and their chance of survival. Experiments on horizontal planting of cuttings by Šumilina's method [cf. *For. Abstr.* 11 (No. 83)] gave very unsatisfactory results (88% mortality), possibly owing to drought.

1161. Podhorski, I. Vegetativno razmnažanje topola spojenim reznicama i svinutim prutovima. [**The vegetative propagation of Poplar by (1) notch-grafted [stem] cuttings and (2) bent shoot-cuttings.**] *Šum. List* 75 (3/4), 1951 (157–64). [Croat.e.]

Describes preliminary results of trials with two new methods of rooting Poplars at the Forest Research Institute, Zagreb. The trials were carried out mainly on *P. serotina*. (1) In the notch-grafting

method, two cuttings of roughly the same length, which might be between 18 and 25 cm., and at least 1 cm. thick, were joined. The basal cuts were made below the lowest bud, and in the main cutting the apical cut was made immediately above the top bud, while the subsidiary cutting had no top bud. A wedge-shaped notch was made in the main cutting 5 cm. below the apical cut, and the top end of the subsidiary cutting was inserted into the notch, the two cuttings making an angle of about 30°. The unions were not sealed with wax. The grafted cuttings were planted immediately in a hole deep enough to cover the union. They developed two root systems and a common stem from the top bud of the main cutting. (*a*) Grafting of cuttings of the same species: In 1949, cuttings were planted in poor soil and were damaged by drought and cockchafer larvae. Nevertheless, 75% of the grafted cuttings and 50% of the controls rooted; average shoot lengths were 30 and 21 cm. respectively. In 1950, 20 grafted cuttings and 30 controls were planted in good Poplar soil; 95% of the grafted and 67% of the control cuttings rooted, average shoot heights being 118 and 87 cm. respectively. In neither year was there any watering. (*b*) Grafting of cuttings of different species: Two successful grafts were made, with *P. nigra* as the main and *P. wislizenii* as subsidiary cutting. The union was strong but the shoots, presumably because of poor soil, drought and insect damage, reached lengths of only 37 and 29 cm. (2) In the bent-shoot method, 1-year shoots 0·5–1 m. long were set in a narrow horizontal furrow 20–30 cm. deep and slightly shorter than the cutting; the cut end was pressed against a bottom corner, and the top end of the cutting bent upwards against the opposite end of the furrow, with the top of the cutting (up to 5–10 cm.) or only the bud projecting. Cracks at the bend healed quickly. In 1949, 66 bent cuttings 1 m. long were planted. Survival of the bent cuttings was 100% and of controls 50%; average shoot lengths were 50 and 21 cm. respectively. In 1950, 30 control cuttings, 21 bent-shoot cuttings of 50 cm., and 20 of 100 cm. were planted. Survivals were 67, 100 and 85% and average shoot lengths 87, 113 and 140 cm. respectively. In neither year was there any watering. Roots formed mainly on the ½ or ⅓ of the cutting nearest the cut end; on one cutting of *P. berolinensis* roots developed along the whole length of the underground portion. In all cases shoots developed only from the top bud. They developed unusually quickly, and had a sturdy stem and leaves darker, thicker and harder than from ordinary cuttings. Encouraging results were obtained from bent-shoot cuttings of *P. nigra*, *P. berolinensis*, *P. candicans*, *P. wislizenii* and *P. deltoides* var. *monilifera*.

1162. Branco, A. C. de S. Castelo. **Vegetative propagation by root cuttings.** *Nature, Lond.* 168 (4264), 1951 (125–6). [Laboratório de Arboricultura do Instituto Superior de Agronomia, Tapada da Ajuda, Lisbon.]

Experiments were made in December with several forms of pre-treatment of root cuttings of *Lagerstroemia indica:* (1) storage for 2 weeks at low temperatures (0–2° C.), and (2) storage for (*a*) one, and (*b*) two weeks in a dry atmosphere (relative humidity 50%). Immediately after each treatment, the cuttings were put in a rooting medium of equal proportions of sand and garden soil, in a greenhouse, together with controls. Best results were obtained with cuttings subjected to treatment (2)(*a*), which showed 82% rooting after 1 month, compared with 8% for (2)(*b*), 0% for (1), and 42% for controls. Similar experiments in March, a season not commonly used for propagating this type of cutting, gave 38% rooting for (2)(*a*), 12% for (2)(*b*), 0% for (1), and 2% for controls. The better rooting of cuttings subjected to dehydration for 7 days is held to be due to interception of the polar translocation of auxins, which renders the rooting process independent of the season of planting.

1163. Herrmann, S. Heteroplastische Transplantationen bei Holzpflanzen. **[Interspecies grafts of trees.]** *Naturwissenschaften, Berlin* 38 (4), 1951 (101). [G.] [Forstbotanisches Institut der Universität, Göttingen.] O.R.S.

In the spring and summer of 1949, grafts were made of Spruce on Pine and of Pine on Spruce and Larch. The annual shoots of 1950 were normal and in some cases, unusually strong. In 1950 the grafts were successfully repeated. Successful grafts were also made of Spruce on *Larix decidua*, *Abies* sp., *Pseudotsuga*, and *Pinus mugo*, and of these species on Spruce; of Pine on *Abies* sp. and *Pseudotsuga* and of these species on Pine; of *Pinus mugo* on *L. decidua*, *Abies* sp. and *Pseudotsuga*, and of these species on *P. mugo*.

With the Fagaceae, grafts were effected with difficulty within most species. *Fagus sylvatica* and *Castanea vesca* were successfully grafted on *Quercus sessiliflora*. There were many successful grafts within the genera *Fagus*, *Quercus*, and *Castanea*. *Halimodendron argenteum* grafted on to *Caragana arborescens* showed 3–5 times its natural growth. Chlorophyll-deficient seedlings of *Citrus trifoliata*, which otherwise died within a few weeks, were grafted by inarching with normal plants; they died back from above, but put out new normal shoots near the point of union.

1164. Armstrong, W. D., and Brison, F. R. **Delayed incompatibility of a Live Oak/Post Oak graft union.** *Rep. Nth. Nut Growers Ass.* 1949 (181–2). 3 refs. C.G.B.

1165. Boer, S. de, and Vogel, P. de. Het enten van walnoten. **[Grafting Walnuts.]** *Jaarboek, Vereniging 'De Proeftuin' te Boskoop, 1950* [1951] (67–9). [Du.]

Grafts were made under glass on seedlings of *J. nigra* and *J. regia* between 22 March and 10 May. Two kinds of apical graft were used, both on stocks cut down to stump level: a form of splice-graft, and a modified saddle graft. In the latter, the rootstock was cut obliquely, and the bark on its long side was separated from the stem by a vertical cut; the scion was cut as for a saddle graft, but the outer side of the leg under the bud was cut obliquely downwards to a point and this point was inserted inside the loosened bark of the stock. Both types of graft were bound with waxed cotton. The grafts

were left in the greenhouse under double glass for some weeks, then hardened off and planted out at the end of June. The following tentative conclusions were drawn: Rootstocks of *J. nigra* and *J. regia* give equally good results. Grafts made on 22 March give a larger number of successful unions than April ones, and grafting in May cannot be recommended. Growth of the rootstocks should not be too far advanced. The modified saddle graft gives a larger number of successful unions than the splice graft. Further experiments will be made.

232.33. *Formation of Stands by Direct Sowing*

See also Nos. 1099, 1125, 1189, 1222.

1166. STEIN, W. I. **Germination of Noble and Silver Fir seed on snow.** *J. For.* 49 (6), 1951 (448–9).

Many seeds of *Abies procera* and *A. amabilis* were found in June to have germinated on banks of snow in the Wind River Experimental Forest, but only two managed to establish their root tips to a depth of ¼ in. into the soil; their stems were very crooked and elongated. Seedlings that had germinated on bare ground near by were firmly anchored several inches deep in the soil. One of the techniques of broadcast sowing of tree seed is to sow on snow. These findings indicate that this procedure may not always be successful with Balsam Firs, because they germinate prematurely on top of the snow and fail to produce established seedlings when the snow melts.

1167. FOWELLS, H. A., and SCHUBERT, G. H. **Recent direct seeding trials in the Pine region of California.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 78, 1951. pp. 9. 5 refs.

Summarizes the results of experiments in spot sowing carried out over a number of years. Seed spots screened against rodents, gave as good results as those obtained by planting.

1168. SVIRIDENKO, P. A. Gryzuny—rashititeli lesnyh semjan. **[Rodents as robbers of forest seed.]** *Zoologičeskii Žurnal, Moskva* 23 (4), 1944 (170–80). 22 refs. [Russ.e.] [Institute of Zoology, Moscow State University.] B.A.P.

Observations on the feeding habits of some species of *Apodemus* and other mice and voles, with special reference to their depredations on forest seed and seedlings. In normally sown Cork Oak plots inhabited by a relatively low population of *A. flavicollis* and *A. agrarius*, only 3% of the seed remained after 22 days, the greater part having been removed by *A. flavicollis*. Experiments showed that covering the seeds with earthenware pots is ineffective. Protection of the seed with thorns of *Ruscus aculeatus* was successful against *A. agrarius* but not against *A. sylvaticus ciscaucasicus* or *A. flavicollis ponticus*. Wire-netting cylinders of 1 × 0·5 cm. mesh, afforded complete protection against all 3 species for both seeds and seedlings.

1169. GAVRILOVIĆ, S. Ručna sejalica-kopačica za setvu šumskog semena. **[A hand-operated combined sowing-stick and hoe for the sowing of forest seeds.]** Pp. 24–8 in *Tehničke i Laboratoriske Novosti Instituta*, Institut za Naučna Istraživanja u Šumarstvu NRS, Belgrade. 1949. [Serb.russ.]

An illustrated description of a sowing-stick designed by the author, in which pressure exerted by hand on a handle (similar to a cycle brake-lever) (1) causes a certain amount of seeds to be delivered from the seed container through a funnel into a wedge formed by the main stick and an angle-lever attached to it and inserted in the soil, and (2) opens this wedge, thus depositing the seeds into the soil.

1170. LESLIE, A. P. **A new aid to reforestation.** *Pulp Paper Mag. Can.* 52 (6), 1951 (122–3). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1174 (*F*–2).)

Illustrated description of a new, hand-operated sowing tool developed by the Ontario Department of Lands and Forests. The seeds, pelleted in order to build them up to a smooth, uniform size, are put into the ground one at a time by means of the tool, which is a type of probe. A fair range of sizes from uncoated White Spruce to coated White Pine seed can be handled. The tool will probably be of particular value in introducing conifers into stands of Poplar, or Poplar and Birch. Cost per acre is from $1.50 upwards.

232.4. Formation of Stands by Planting

See also Nos. 1099, 1104–5, 1141, 1153, 1179, 1190.

1171. PINCHIN, R. D. **Nursery extension experiments at Radnor Forest.** *Rep. For. Res. For. Comm. Lond. 1949/50*, 1951 (24–7).

Summarizes the follow-up in the forest, of experiments made in 1921–7 to test the effects of different densities and methods of sowing, and of grading of seedlings and transplants, for Douglas Fir, Norway and Sitka Spruce, and European Larch. Results were mainly negative, except that grading of transplants (unlike grading of seedlings at time of lining out) into good plants and culls gave positive results: the mean height for all good plants at the end of the 8th growing season was 60·6 in. compared with 48·0 in. for the culls.

1172. STOECKELER, J. H., and LIMSTROM, G. A. **Reforestation research findings in northern Wisconsin and upper Michigan.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 23, 1950. pp. 34 + 2 gphs. 9 refs.

Summarizes the results of experimental and pilot plantings made between 1937 and 1949 on 490 acres in national forests. The results, which are tabulated and discussed, relate to choice of species for planting and sowing; the effect of class and size of planting stock, ratio of top to root, grading of nursery stock, season of planting, ground preparation and method of planting; climate, soil and moisture conditions, wildlife, insects, and disease; the effect of an overstorey; underplanting of Aspen; and planting site classification.

1173. MERZ, R. **Comparative survivals and costs of plantations by different methods of ground preparation and planting.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 64, 1951. pp. 2.

Early results (after the 1st and 2nd growing seasons) of 2 experiments on old fields in southeastern Ohio show little difference in survival of White and Red Pine when different methods of ground preparation (no preparation, scalping, single

and double furrows, and 24-in.-deep ripping) and of planting (machine, bar-slit, and mattock) were used. Relative costs of the methods were also determined and show that machine planting with no ground preparation was the cheapest, and planting by the mattock method in scalps the most expensive method. Results are tabulated. The plantings are too young for comparisons of growth to be made. [Cf. *For. Abstr.* 13 (No. 286).]

1174. SLOCUM, G. K. **Survival of Loblolly Pine seedlings as influenced by depth of planting.** *J. For.* 49 (7), 1951 (500).

Seedlings of the same size and apparent vigour were bar planted in the field in three rows, (1) at the 'correct' depth, (2) with ¼ of the stem (2·25 in.) underground, and (3) with ½ of the stem (4·50 in.) underground. After 20 months, survival was the same in all rows (96·7%), average height was 17·0, 15·5, and 13·7 in., and average current growth 8·0, 8·7, and 9·2 in. respectively. The higher rate of current growth in (2) and (3) was possibly due to their roots being in a stratum of more uniform moisture content.

1175. LUNT, H. A. **Effect of slash mulch and slash burn on Pine and Spruce plantings.** *Bull. Conn. agric. Exp. Sta.* No. 548, 1951. pp. 21. 16 refs.

The experiments were made on sandy soils. (1) Freshly cut 7-ft. trees from a *Pinus resinosa* plantation were laid between and under the remaining trees. (2) Green *P. strobus* slash, obtained from another part of the plantation, was spread between 4-ft. trees of the same species. (3) Dead *P. strobus* slash and (4) dead *P. sylvestris* slash, each used on the land on which it was produced, were added to certain plots and burned on other plots, prior to planting with *P. strobus* and *Picea abies*. Survival counts (on the new plantings), increment measurements, and soil studies, were made over a period of 3–6 years.

Survival of *P. strobus* and *Picea abies* was essentially unaffected by treatment, except that in one case Spruce survival was reduced by 20%. The effect of slash on increment appeared to be dependent on kind and source of slash, and species treated.

Experiment (1) was not beneficial; (2) increased growth by *ca.* 13% over a 6-year period; (3) produced 13% increase in growth in 5 years; (4) had no effect. The probable explanation is that *P. resinosa* is less exacting than either *P. strobus* or *Picea abies*; that both *P. resinosa* and *P. sylvestris* slash, being lower in nutrient content compared with *P. strobus* and *Picea abies*, add fewer nutrients to the soil; and that slash produced on poor soil and on the same area is less effective than that grown on another area of more fertile soil. Burning the slash before planting, increased growth of *P. strobus* by 17–18% but had no effect on *Picea abies*. Soil tests indicated that available K and total soluble salt content were slightly higher under slash, and considerably higher where slash was burnt.

1176. MACKENZIE, A. M. **Spacing experiments in conifers.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (59–61).

Early (1933–6) spacing trials were assessed and future treatment determined. Spacings were 3, 4½, 6, and 8 ft., and covered most of the species commonly used in the U.K. Results showed that variation in spacing had no significant effect on height growth, which is surprising in view of the different dates on which the different spacings closed canopy. Percentage survivals were similar in all spacings for any given site, but denser plantings of European Larch suffered worst from die-back. Studies were made of crown spread, branch thickness, and individual stem diameters, all of which increased with wider spacing, while stem form, length of bole, and taper were better in closer spacings. The indications are that spacing should be varied according to site conditions, and that wider planting distances than those current at present could be adopted on good sites.

1177. WOOD, R. F., and NIMMO, M. **Spacing of Oak in plantations.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (55–9).

The results of trials laid down in 1927–8 are finally summarized, and indicate that spacings of 4 × 2 ft. are wasteful. A spacing of 4 × 4 ft. give satisfactory stocking, given seed of a good source, a reasonably suitable site, and proper weeding. Bunch plantings at wide centres (5 × 3 ft.) gave the best stocking and distribution of desirable stems, but there was no advantage in increasing the number of plants per bunch from 3 to 6.

232.5. Artificial Formation of Stands by Vegetative Propagation

1178. **Young sprouts used as Bamboo planting material.** *Carib. For.* 12 (1), 1951 (14, 31). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11, [1950?].)

In the first year after planting, Bamboo produces 2–4 shoots about ½-in. in diameter. These, severed with a sharp machete or jack saw when 5–6 ft. high, were successfully used for propagation in Puerto Rico. With *Bambusa longispiculata* early survival was 70% or more. Such material has the advantage of being considerably lighter in weight than the usual Bamboo planting material. If one shoot is left uncut the parent plant does not die.

233. *Afforestation*

See also Nos. 1026, 1104, 1128, 1299, 1785.

1179. ZEHETMAYR, J. W. L. **Experiments in planting of upland heaths.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (27–33).

A brief review is given of a number of old experiments, the results of which are being prepared for publication. Ground preparation for planting is mentioned, describing the stages leading up to the current procedure of deep single-furrow ploughing, the beneficial effects of which are largely attributable to the suppression of heather by the spoil. Best results are obtained by planting in the furrow bottom. Nurse crops and mixtures are mentioned. Difficult species such as Douglas Fir, Sitka Spruce and *Tsuga* can often be successfully established by using Broom or some species of Pine as a nurse crop from the start. Manuring at the time of planting has clearly indicated the advantage of using both phosphates and N on the poorest heath types, even

for Pines. Recent work on planting 1-year seedlings has given rather variable results: in favourable seasons, outstandingly successful establishment of plantations has been achieved very cheaply, and even in bad seasons the total cost of planting with seedlings followed by replacement of up to 30% casualties, may be cheaper than complete initial planting with transplants.

Historical reports on heathland experiments at Hamsterley and Allerston forests are briefly reviewed, and a note on an investigation into the causes of failure of Sitka Spruce to grow properly on certain sites at Clachindarroch Forest (W. Aberdeenshire), is given, together with recommendations for treating the various ground types where initial planting had failed to yield a crop.

1180. MACDONALD, J. A. B. **Plantations on peatlands.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (33–6).

Some preliminary draining experiments on peatlands have demonstrated that, in dry periods, a drop of up to 50% in the depth of the watertable can be achieved in one season by deepening 9- to 10-in. drains to 30 in., thereby greatly increasing the available rooting space. Further experiments are in hand to determine the long-term effects of increased drainage, including its effect on the wind-firmness of the crop.

A start has been made with trial plantations of various species, pure and in mixture, to ascertain whether economic crops can be grown on high-level heather areas in the Border forests, and on the difficult peatlands in Caithness and Sutherland, both types hithero considered unplantable.

1181. HORVAT, A. O nekim neposrednim zadacima istraživačkog rada na degradiranom krsu. **[Some immediate tasks of research work in the degraded Karst.]** *Šum. List* 75 (1/2), 1951 (43–50). 10 refs. [Croat.it.]

Karst afforestation has not given the results expected. The main reasons for this are briefly enumerated and immediate research tasks for surmounting the difficulties are presented.

1182. SALDARELLI, R. Il rimboschimento di Monte Pellegrino. **[The afforestation of Monte Pellegrino, Sicily.]** *Monti e Boschi* 1951 (8/9), (339–48). [It.f.e.]

Includes a list of tree, shrub and herbaceous species found in the plantations. Eucalypts, Robinia and *Ailanthus* were used in mixture with various Pines.

1183. BUTLER ORBETA, J. M. Las Hurdes y su repoblación forestal. **[Las Hurdes and its reforestation.]** *Montes, Madrid* 7 (39), 1951 (186–94). [Span.]

A summary of the work of the Forest Service from 1942 to 1950 in Las Hurdes, a mountainous district in the north of the province of Cáceres. A report is given of the progress of the [*Pinus pinaster*] stands (with a map of the area reforested), and on the building of roads and houses for personnel.

1184. NAVARRO GARNICA, M. La Sierra de la Virgen en repoblación forestal. **[Reforestation in the Sierra de la Virgen.]** *Montes, Madrid* 7 (39), 1951 (203–11). [Span.]

A report on the work accomplished in this district and on the species tried. *Pinus pinaster* and *P. sylvestris* (especially the former) have been the most successful species. *P. pinea* appears not to thrive at altitudes above 1,000 m., and is difficult to transplant with bare roots.

1185. JAIME FANLO, F., and NAVARRO, M. Repoblación de riberas. **[Reforestation of river banks.]** *Montes, Madrid* 7 (39), 1951 (219–40). [Span.]

By the Spanish forest law of 18 October 1941, the areas on river and stream banks lying between the low-water mark and average flood level were given over to the State Forest Service, which is responsible for their reforestation and maintenance. Some particular problems of torrent training are discussed, and methods of planting 3 types of bank are described. (1) Rivers or streams with narrow banks (i.e. 100–150 m. wide) and no natural vegetation. Here dense stands spaced at 2 × 2 m., i.e. 2,500 plants/ha., are advised, the rows being placed to meet the direction of the current obliquely. (2) Rivers with banks up to 400 m. wide, with abundant vegetation, e.g. Tamarisk and Willow, and where the ground is often uneven. Here, the ground can be levelled and the soil prepared by mechanical means. Trees should be spaced at 2 × 3–3·5 m. to permit the passage of a tractor and harrow. The wide rows are planted at right angles to the current, the narrow rows parallel to it. Where the ground is uneven, small wells should be dug for watering purposes, each serving a radius of about 60 m. (3) Very large rivers, such as the Ebro, where the banks sometimes extend to a width of 1 km., and are often occupied by wide strips of thicket, consisting of Tamarisk, Osiers, Poplar and Willow suckers, rushes etc. In reforesting such areas the land may be ploughed, levelled, and trenched for gravity irrigation. Planting furrows should be ploughed at least 40 cm. deep and 3–3·5 m. apart. Methods of watering, planting, pruning and cleaning such plantations are described, and the choice of species is discussed. In the Aragon region the *Populus nigra* group of Poplars is preferred because of its great resistance to salinity and drought. Species resistant to *Venturia populina*, such as *P.* '*canadensis*' in its 'grey' forms should be chosen. When hand planted, the rows should be 2 m. apart, with the trees also 2 m. in the row. If mechanical methods are used, the rows may be 3–4 m. apart. If the plantations are near the water-course, the rows should meet the direction of the current at an angle of 45°, in order to facilitate drainage after flooding. Pruning up to ⅓ of total height should be done in winter.

1186. KARELIN, T. I. Zaščitnaja rolj ivnjakovyh pribrežnyh polos v borjbe s pesčanymi nanosami. **[The protective rôle of river-bank strips of Willow in the fight against sand deposition.]** *Lesn. Hoz.* 1950 (5), (82–3). [Russ.]

Recommends belts of Willow, planted along the brow and slope of river banks, as a protection against the deposition of sand and debris upon neighbouring land in flood time. Experiments in

the Komi A.S.S.R. show that for medium-sized and small rivers, belts 2–3 m. wide, planted at a density of 35–40 plants per sq. m., are satisfactory. At bends and places where the current is rapid, the width of belt should be increased to 4–5 m. with maximum density. Besides arresting sand and small rubbish, they should also prevent timber being carried considerable distances from the river bed and stranded there.

1187. DRAR, M. **The problem of the Sudd in relation to stabilizing and smothering plants.** *Bot. Notiser* 1951 (1), (32–46). 7 refs. [E.] O.B.D.

The Sudd, lying between Lake No and Mongalla on the White Nile, is a depression, the greater part of which is covered with dense swamp vegetation. The author describes the vegetation of the region and suggests that belts of trees intersected by groups of shrubs should be planted, one on each side of the approximate course of the river, first in the non-flooded and periodically flooded areas, and later in the permanent swamp. This would stabilize the present low banks, raise their level, and kill the weeds fringing them. It would also build up higher ground where banks are lacking, prevent the swamp vegetation from being driven into the channel by strong winds and stop surface erosion of the southernmost high banks. A list of suggested species is appended.

1188. GORDON, W. A., and HAMBOULAS, K. **A combined operation.** *Emp. For. Rev.* 30 (2), 1951 (158–65 + 12 photos).

Describes an attempt which is being made in Cyprus by several Government departments to reclaim an area of marshland, most of which lies below sea level. The marsh has been drained and partly afforested with Eucalypts, and the most important aim, the elimination of breeding places suitable for the anopheles mosquito, has already been achieved. It seems likely, although by no means certain, that afforestation may be a necessary stage in the reclamation of the marsh to a higher form of land use. However, the soil in many places is very rich, with ample water near the surface even in summer, and, in spite of the high returns which Eucalypt forest can give on land of this sort, it seems probable that the foresters and agriculturists may have to reach some compromise later on. The principal difficulties so far encountered have been opposition from the local population, waterlogging of the soil even after drainage, regrowth of marsh vegetation and surface salinity in certain areas. *From author's summary.*

1189. AFRIDI, F. G. **Afforestation in the semi-arid tracts of the Trans-Indus N.W.F. Province.** *Pakistan J. For.* 1 (3), 1951 (261–3).

Notes on times and methods of sowing (in trenches or on ridges). A table gives 1st year's growth, on 3 types of soil, of *Acacia arabica, A. modesta, Dodonaea viscosa, Prosopis glandulosa, P. juliflora, Zizyphus jujuba* and *Z. nummularia.*

1190. BROADFOOT, W. M. **Forest planting sites in north Mississippi and west Tennessee.** *Occ. Pap. Sth. For. Exp. Sta.* No. 120, 1951. Pp. 15.

Describes the most important kinds of site on eroded land there, and recommends tree species and planting methods.

1191. MERZ, R. W., and FINN, R. F. **Differences in infiltration rates on graded and ungraded strip-mined lands.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 65, 1951. pp. 2.

Poorer tree survival and growth on graded than on ungraded banks in strip-mined areas [cf. *For. Abstr.* 12 (No. 1961)] is attributed to compaction of the soil by heavy grading equipment, with reduced rate of water infiltration. Mean infiltration was found to be on an average more than 10 times greater on ungraded banks than on graded ones.

235. *Underplanting, Advance Planting etc. Nurses and Formations of Mixtures*

See also Nos. 900, 1105, 1172, 1179–80, 1219, 1499, 1785.

1192. **Underplanting of *Casuarina* stands shows promise.** *Carib. For.* 12 (1), 1951 (14, 32). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11, [1950?].)

In the absence of natural regeneration of *C. equisetifolia* in Puerto Rico, tests have been made of underplanting the stands shortly before felling. One year's growth has shown that survival is high and good height growth has been made by *Cordia alliodora, Inga vera, Petitia domingensis, Swietenia mahagoni* and *S. macrophylla.* Underplanted seedlings of *C. equisetifolia* do not thrive, apparently because of shade intolerance.

1193. LOGAN, K. T. **Development of one-year-old Norway Spruce and White Spruce planted beneath a girdled mixedwood stand.** *Silv. Leafl. For. Br. Can.* No. 53, 1951. pp. 2.

This experiment showed that 1 + 0 *Picea abies* and *P. glauca* stock can be planted with some success on good sites in competition with other species. Use of older stock would undoubtedly reduce the period of adjustment during which there is little growth, and result in better survival.

1194. CHAPMAN, A. G., and LANE, R. D. **Effects of some cover types on interplanted forest tree species.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 125, 1951. pp. 15. 6 refs.

In Illinois in 1940, plantings of *Liriodendron tulipifera, Prunus serotina, Fraxinus lanceolata, Quercus borealis* var. *maxima*, and *Q. alba* were made on old field, and under Sassafras, planted Pine and planted Black Locust (*Robinia pseudoacacia*). In Ohio in 1941, *L. tulipifera, F. lanceolata* and the 2 Oaks were planted on old field and under Black-Locust covers. In Ohio in 1938 *L. tulipifera, F. lanceolata, Pinus strobus, P. echinata* and *P. rigida* were planted on old fields in mixture with, and without Black Locust. Data on survival and height recorded in 1943, 1948 and 1950 are tabulated and discussed. For all the hardwood species, Black Locust was the best form of cover, followed in order by Pine, Sassafras and old field. Hardwoods gave equally good results when planted in mixture with Locust in one operation and when planted under well established Locust. Of the 5 hardwood species.

L. tulipifera responded best, *F. lanceolata* and *P. serotina* next, and the 2 Oaks least well to the effect of Locust on the site. *P. echinata* and *P. rigida* all died when planted with Locust; *P. strobus*, which is more tolerant of shade, showed good survival, but its growth in Locust was much less than in the old-field cover. [Cf. *For. Abstr.* 12 (No. 1962); 13 (No. 900).]

1195. HEGER, A. Die Begründung von Mischwäldern auf Grosskahlflächen unter besonderer Berücksichtigung des Vorwaldgedankens. [**The establishment of mixed forests on large clear fellings, with special reference to the concept of pioneer forest.**] Neumann Verlag, Radebeul and Berlin. 1949. pp. 48. [G.] Price *DM*2.80 [6*s.*].

Stresses the need for raising more timber by using fast growing pioneer species (Birches, Alders, Aspen, Larch etc.) and considers the technique of reforestation with such species in the chief growth regions of Germany, setting up the selection forest as the ultimate aim of German forestry.

1196. COTTERELL, SIR R. **Planting of hardwoods in mixture.** *Quart. J. For.* 45 (3), 1951 (145–55).

The reasons for planting mixtures, their planning management, and methods of planting, are discussed. Several actual examples are given of the planning of mixtures—Oak and Spruce on cleared old woodland on old red sandstone in the W. Midlands, Douglas Fir and Ash on a similar site, and a mixture of Oak and Ash with successive catch crops of Spruce (Christmas trees), Larch (rustic-size poles) and Chestnut. Emphasis is laid on the importance of recording the object of the mixture and indicating the probable subsequent treatment.

236. *Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)*

See also No. 1100.

1197. CANDY, R. H. **Reproduction on cut-over and burned-over land in Canada [east of the Rocky Mountains].** *Silv. Res. Note. For. Br. Can.* No. 92, 1951. pp. 224 + map in pocket. 31 refs.

This reproduction survey, carried out from 1946 to 1948 in important forest regions from the Atlantic to the Rocky Mountains, was based on a stocked-quadrat system, using 1-milliacre quadrats, plus an actual count of reproduction on every 20th quadrat. In all, 583,000 quadrats were examined and the data recorded directly on punched cards. A careful study was made of the methods employed in collecting data, and after a revision which was made for the last year of the survey, the methods were considered generally satisfactory. Large areas can be covered quickly in a cheap and practical way. The results of the survey are summarized in 3 sections: (1) the Maritime Provinces, Quebec and the N.E. clay belt of Ontario; (2) Western Ontario, and (3) the Prairie Provinces. Appendices include the field-party instructions, the tabulated data, and a summary of the Reproduction Survey 1947–1949, Project 16, covering the western and central portions of Newfoundland on a different method of assessment.

237. *Amelioration of Forest Sites*

See also Nos. 1100, 1175, 1179–80, 1785.

1198. CAMPBELL, J. A. **Dropping trials of [ground] limestone from Lancaster aircraft [on hill areas].** Pp. 79–93 + 16 photos, in *Hill Farm Research*, H.M. Stationery Office, Edinburgh. 1951.

A satisfactory dispersal of lime was obtained by drops from 750 ft. at 160 m.p.h. when the slings were loaded with 14-lb. or 28-lb bags; 14-lb. bags were superior, as they gave more complete dispersal of their contents. Smaller bags (7 lb.) were unsatisfactory.

238. *Timber Plantation Crops requiring Special Treatment*

See also Nos. 885, 1790.

1199. PICCAROLO, G. La pioppicultura nella valle padana. [**Poplar-growing in the Po valley.**] *Ital. agric.* 88 (6), 1951 (341–52). [It.] E.M.B.

Silvicultural methods and notes on genetics and taxonomy.

24. TENDING OF STANDS AND TREES

See also No. 1063.

1200. HEGER, A. Lehrbuch der forstlichen Vorratspflege. [**Manual of forest stock-tending [i.e. tending directed towards improvement of the growing stock in any type of forest and at any stage in its life].**] Neumann Verlag, Radebeul and Berlin. 1950. pp. 152. 93 refs. [G.] Price *DM*6.40 [14*s.* 6*d.*]

The author, who favours irregular, quasi-natural forest and opposes clear felling and rigid tending systems which discountenance any opening of the canopy, expounds the principles of *Vorratspflege* and their application to German forests in their present, often unsatisfactory, condition. While insisting that, in his view, the regular, clear-felled forest militates against the ideal of tending for the highest yield combined with maximum resistance to injuries, he emphasizes that the principles can be applied to some extent—and with advantage—in any kind of forest. The longest section of the work (pp. 16–129) is in fact devoted to their application to forest with regular age-classes, since the great majority of German forests are so constituted and are held to stand most in need of such tending. This section deals separately with the problems of tending in the plant, thicket, pole and older stages. Selection and farm forests are discussed in a brief section (pp. 130–3), and the final section (pp. 134–47) has chapters on pruning, care of the soil, and determining the effectiveness of tending measures.

242. *Thinnings*

See also Nos. 1271, 1461.

1201. ZIMMERLE, H. Fichtendurchforstungsreihe im Forstbezirk Biberach. [**Thinning Spruce in the forest district of Biberach.**] *Forstwiss. Cbl.* 70 (2), 1951 (92–103). [G.]

Present results of a preliminary study of plots, 18–23 years old, thinned according to 4 different methods in 1934–5.

1202. WILSON, G. M. **Thinning 30-year-old Jack Pine.** *Silv. Leafl. For. Br. Can.* No. 52, 1951. pp. 3

None of the light or moderate treatments tested on sample plots in 1924, appeared to have made any noticeable difference when the plots were re-measured in 1948.

1203. Boggess, W. R. **Row-thinning in a 14-year-old Shortleaf Pine plantation in Southern Illinois.** *For. Note. Ill. agric. Exp. Sta.* No. 24, 1951. pp. 3.

Describes the project, in which every 4th row was removed. The middle row of each remaining set of 3 rows will be removed in the second thinning, and subsequent thinning will be crown thinning. [Cf. *For. Abstr.* 12 (No. 822).]

1204. Chapman, H. H. **Effect of thinning upon yields of second-growth Longleaf Pine on site 80 in La Salle parish, La.** *J. For.* 49 (8), 1951 (578–9).

1205. Cutten, E. Y. **The development of a stand of *Pinus strobus* L. in Waiotapu State Forest.** *For. Res. Notes N.Z. For. Serv.* 1 (2), 1950 (19–27).

A study of thinning intensities.

1206. **Rapid basal area increment calls for short cutting cycles.** *Carib. For.* 12 (1), 1951 (14–5, 32). [E.Span.) (*Rep. U.S. trop. For. Exp. Sta.* 11 [1950?].)

Studies in young improved stands in Puerto-Rican mixed forest indicate that the average diameter ranges between 3·5 and 6·0 in. and that the optimum basal area for stands of this diameter range is 60–100 sq. ft./acre. To maintain this density, thinning is needed when the basal area left after the previous felling has increased *ca.* 25%. A table gives the length of cycle necessary for such an increase for different types of stand.

243. *Opening of the Canopy (Increment, Overhead Release and Improvement Fellings)*

See also Nos. 1012, 1307–8.

1207. Peevy, F. A. **New poisons for undesirable hardwoods.** *J. For.* 49 (6), 1951 (450).

Eight formulations of 2,4-D and 2,4,5-T were applied by different methods (notches, frills, stumps, injection, sprays) to *Quercus marilandica* trees 2–10 in. in diameter, and compared with Ammate treatments. In general the isopropyl ester of 2,4-D gave the most consistent and effective results.

1208. Kuntz, J. E., and Riker, A. J. **The translocation of poisons between Oak trees through natural root grafts.** *Abstr.* in *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (242). O.R.E.

In experiments to prevent tree-to-tree spread of the Oak wilt disease, Oak trees were heavily treated with Na_2HAsO_3 (61·5% solution), Ammate (dry), $NaClO_3$ (dry), Borascu (dry), and 2,4,5-T (isopropyl ester, 40% solution). Unmeasured quantities were applied in small holes either in the buttress roots or in the root-collar region. With applications of Na_2HAsO_3, Ammate and $NaClO_3$, not only were the treated trees rapidly killed, but also several adjacent untreated trees. The greatest distance of translocation and the maximum number of neighbouring trees involved per treated tree were as follows: Na_2HAsO_3. 45 ft. and 7 trees; Ammate, 25 ft. and 3 trees, $NaClO_3$, 20 ft. and 2 trees. Wide-spread natural grafting of Oak roots was discovered. [Cf. *For. Abstr.* 12 (No. 3388).]

1209. Stoeckeler, J. H. **Scrub Oak control in Wisconsin with ammonium sulfamate.** *Abstr.* in *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (248). O.R.E.

Frilling of *Quercus ellipsoidalis* and treating the frills with a tablespoonful of Ammate gave 73·3% kill in Wisconsin, where the trees were competing with the more valuable *Pinus banksiana*. Cost was reckoned at *ca.* $2·49/100 treated trees. Growth rate of *P. banksiana* was 50% greater in the treated plots.

245. *Tending of Trees, Pruning etc.*

See also Nos. 1185, 1445, 1460, 1512.

1210. Kotok, E. S. **Shall we prune to provide peeler logs for the future.** *Timberman* 52 (10), 1951 (104, 106, 108–9). 4 refs. [Pacific Northwest Forest and Range Experiment Station.]

Data were collected in south-west Oregon from well stocked, nearly even-aged stands, ranging from 20 to 150 years old. Some 350 young Douglas Firs and 200 young Ponderosa Pines on 34 different areas were measured for diameter, age, height, crown-class, height to first branch (clear length), height to first live branch (height to live crown) and average branch diameter. The height to the live crown for Douglas Fir is 17 ft. at 22 years, and 33 ft. at 32 years, increasing steadily with age. For Ponderosa Pine it is 17 ft. at 29 years, and 33 ft. at 44 years. These heights are considered to be the 'clear length potential' to which trees could be pruned without removing live crown. By natural pruning, Douglas Fir reaches a clear length of 17 ft. at 77 and of 33 ft. at 107 years, and Ponderosa Pine at 78 and 103 years. By artificial pruning, Douglas Fir and Ponderosa Pine could be pruned to 17 ft. at 22 and 29 years and to 32 ft. at 32 and 44 years respectively. At these ages, branches average less than 1 in. in diameter and should prune readily and heal rapidly. Figures are given illustrating the amount of clear wood obtainable from pruned and unpruned trees at different ages; for the lower two 16-ft. logs of an average 120-year-old Douglas Fir, the amount of clear timber is estimated at nearly 36 cu. ft. for the pruned and about 15 for the unpruned tree. [Cf. *For. Abstr.* 12 (No. 2959).]

1211. **Walnut pruning.** *Rep. Cent. St. For. Exp. Sta. 1950* [1951] (20–30).

First report on a pruning study begun in 1950 on Black Walnut stands established about 16 years ago after open-cast mining. Four intensities of pruning (0, 25, 50 and 75% of the live crown removed) were applied to 3 sizes of trees (3-, 4-, and 5-in. d.b.h. classes). Removing 25, 50 and 75% of the crown increased the clear portion of the stem to 38, 46 and 60% of the total tree height respectively; the clear length before pruning averaged only 2 ft. out of total heights ranging from *ca.* 20 to 26 ft. Study trees had an average of 1·7 sides open before and 2·4 after pruning (1 side = 90° arc on the crown perimeter). The average width of pruning wounds at all heights on the bole increased with an increase

in the diameter of the tree, and decreased with an increase in their heights on the tree. The average number of pruning wounds per linear ft. of tree stem increased with tree diameter. The frequency of wounds on trees of all sizes increased sharply up the stem to a height of 5–6 ft. (owing to natural shedding of the lower branches) and then decreased gradually to a height of about 14 ft. owing to the longer internodes resulting from higher growth rate.

1212. PRESTON, A. P., and BARLOW, H. W. B. **The use of growth substances to widen crotch angles.** *Rep. E. Malling Res. Sta. 1949/50*, 1951 (76–9 + 2 photos). 2 refs.

An experiment is described where different concentrations of indole-3-butyric acid were applied to cut-back maiden and 2-year-old Plum trees to encourage wide-angled crotches in the primary branch framework. Details of the technique of applying the growth substances to the tree are given. *From authors' summary.*

25. TREATMENT OF DEFECTIVE, DERELICT OR VERY OPEN STANDS

See also No. 1445.

1213. WOOD, R. F., MILLER, A. D. S., and HOLMES, G. D. **Derelict woodland investigations.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (36–40).

At Alton Forest, Hants, a fairly typical derelict woodland on the chalk, a demonstration area has been taken over, stock-mapped in detail, the types of growth and condition of the crop classified, and a detailed plan of treatment drawn up. Two of the main features of derelict-woodland work are the high cost of clearing coppice and other regrowth for planting, and the high cost of keeping this regrowth in check while the planted crop becomes established. Experiments are concentrated on these two main aspects, and in addition to partial methods of clearing in strips and groups, chemical control of regrowth is being attempted. Hazel coppice, Blackthorn, Rhododendron and Ash coppice have been treated with a number of chemicals, of which the most promising so far are NH_4 sulphamate and Na_2HAsO_3. Growth substances, such as 2,4-D and 2,4,5-T, give good kills of shoots, but do not kill the stumps so well as the sulphamate and arsenite.

1214. SANGAR, O. J. **Speedier rehabilitation of English woodlands.** *Forestry* 24 (1), 1951 (1–5). 2 refs.

Suggests the possibility of economical conversion of many derelict areas into useful, though lightly stocked, hardwood or mixed stands, with much less labour than that involved in clearing and replanting.

1215. FEIERABEND, P. Forsteinrichtung am Oberrhein. [**Forest management in the upper Rhine.**] *Forstwiss. Cbl.* 70 (6), 1951 (395–406). [G.]

A study of derelict mixed-deciduous woodland on floodplain between Basle and Breisach, and of the relationship of decline in annual increment to the lowering of the watertable. Recommendations are made for improving the area by planting species tolerant of dry conditions.

1216. SCHAEFFER, L., and A. Amélioration des taillis sous futaie. [**The improvement of coppice with standards.**] *Rev. for. franç.* 1951 (9), (537–51). [F.]

Discusses methods of (*a*) improving, (*b*) converting to high forest, the large areas of derelict coppice-with-standards in France.

1217. MARINKOVIĆ, B. Nekoliko mišljenja i prijedloga k pitanju amelioracije devastiranih makija u Dalmaciji. [**Notes and suggestions on the improvement of degraded maquis in Dalmatia.**] *Šum. List* 74 (5; 6), 1950 (177–87; 259–67). [Croat.f.]

The author distinguishes maquis forest which contains good stands that have not been maltreated and possess some commercial value, from maquis thicket which is either intrinsically poor or has been degraded by misuse. With only a few local exceptions, maquis in Dalmatia belongs to the latter class. In connexion with the new Five-year Plan, which provides for its improvement, the author describes the maquis thicket in some detail, dividing it roughly into 8 types and offering prescriptions for their treatment. The point is made that regeneration fellings can be effected both in the winter and in the summer dormant period, before the mid-August rains break the summer drought and bring a new flush of leaves.

26. FORESTRY IN AGRICULTURAL AND PASTORAL AREAS (INCLUDING SHELTERBELTS AND THEIR TREATMENT)

261. *Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land*

See No. 1100.

262. *Fuel and Fodder Forests*

See also Nos. 1219–20.

1218. SEMPLE, A. T., and PENDLETON, R. L. **Woody legumes for the poor soils of humid equatorial lowlands.** *Indian Fmg.* 11 (6), 1950 (223–5 + 2 plates). 10 refs. O.R.E.

Notes on growing *Leucaena glauca* and *Sesbania grandiflora* as soil improvers and producers of fodder.

263. *Irrigated Forests*

See also No. 1185.

1219. HAKIM, K. A. **Critique of irrigated plantations in the Punjab.** *Pakistan J. For.* 1 (3), 1951 (264–70). 9 refs.

A review of the existing irrigated plantations leads the author to conclude that the policy hitherto pursued of trying to raise timber (*Dalbergia sissoo*) and fuelwood (mainly Mulberry) together is useless, since the Mulberry almost always suppresses the *Dalbergia*. It is suggested that plantations of the latter should be confined to river banks and a few areas of suitable soil, and that future fuelwood plantations should consist of a mixture of Mulberry and Eucalypts.

264. *Farm Forests*

See also Nos. 931–2.

1220. **Tree planting on farms.** [Government Printer, Nairobi.] [1951?]. pp. 12.

Notes on species suitable for planting on different soils in Kenya for (1) timber and poles, (2) fuel and poles, (3) windbreaks, and (4) shade trees in paddocks.

266. *Shelterbelts, Windbreaks*

See also Nos. 1220, 1360.

1221. LINDE, R. J. VAN DER, and WOUDENBERG, J. P. M. **On the microclimatic properties of sheltered areas: the Oak-coppice sheltered area.** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 10, 1951. pp. 151 + 10 photos. 52 refs. [E.e.]

Discusses observations made over a period of 4 years in the northern Veluwe on the effect of narrow belts (5–14 m. wide) of Oak coppice, spaced at distances of up to 50 m., on the microclimate of the sheltered areas and on crops. The results indicate that Oak-coppice strips come into the category of dense windbreaks and therefore do not provide the best shelter.

1222. ÈITINGEN, G. R., KLIMOV, V. I., and KROTOVA, N. G. Dvuhletnii opyt gnezdovogo poseva polezaščitnyh lesnyh polos. **[A 2-year trial of the 'nest' method of direct sowing for shelterbelts.]** *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 16 (4), 1951 (9–15). [Russ.] A.P.B.

An interim report on direct sowings of Oak by Lysenko's method in Tambov Province (forest-steppe zone), 1949 and 1950, and Saratov Province (steppe zone), 1950. Results both for sowings intercropped with various cereals and for those on fallow land, are considered to be good [cf. *For. Abstr.* 13 (No. 328)]. There were differences of survival and growth between the various trials with cover and on fallow land, but these cannot be satisfactorily interpreted at present; special soil and physiological studies will be necessary.

1223. ZYKOV, I. V. Osobennosti snegotajanija i značenie lesnyh polos v sibirskoĭ lesostepi. **[Peculiarities of snow-melting and the importance of shelterbelts in the forest-steppe of Siberia.]** *Priroda, Moskva* 40 (4), 1951 (54–7). 4 refs. [Russ.] A.P.B.

Briefly reports, in general terms, on the author's studies in the northern forest-steppe zone of W. Siberia, along the rivers Tom and Kiya and near Kuznetsk, a rolling plain formerly under forest but now mostly ploughland with degraded chernozem soil, interspersed with clumps of woodland and shrubs. Owing to the very strong, dry east winds, the snow is blown from exposed places and is reduced to a practically structureless dust—almost always showing various degrees of admixture of soil particles eroded from the bared land. During the snow-melting period in spring the winds cause extremely rapid evaporation at the surface of the thin snow cover, and the snow disappears very fast, often without passing through the liquid phase. This results in frequent frost damage to overwintering crops and in loss of water that might have entered the soil. What soil moisture there is, may be quickly evaporated by wind. Any shelter, even stubble, will retard snow-melt, and the difference between the time of complete disappearance of snow in the open fields and in clumps of wood, averages 1 month. The two points of prime importance are therefore to secure a deep and stable snow cover in winter and to prolong the melting period, which depends on depth, total mass of snow, dirt content, structure etc. and on protection from wind.

There are several km. of shelterbelts of a permeable type, 7–10 years old, 7 rows (11 m.) wide and 8–10 m. high, formed of Poplar with an underwood of *Caragana*. On level ground these secure a snow cover for a distance of 120–150 m. (more than ½ on the leeward side). In the absence of underwood a level snow carpet 75–100 cm. deep is formed; when underwood is present, the general snow depth is about the height of the underwood, except for a snow crest 3–4 m. from the leeward side of the belt. Snow depth can be regulated by regulating the height of the underwood. If the shelterbelts are supplemented by a system of artificial screens in between, a satisfactory snow depth can be maintained over the fields, and suitable conditions created for a slow melt in the spring.

268. *Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants, etc.*

See also Nos. 1218, 1307 *et seq.*, 1719, 1740–3.

1224. ELWELL, H. M., DANIEL, H. A., and COX, M. B. **Brush control and pasture development in the Red Plains.** *Agronomy Journal, Madison* 42 (8), 1950 (390–4). 9 refs. O.R.E.

A summary of work carried out by the Red Plains Conservation Experiment Station, Guthrie, Okla. Good results in eradicating Oak were obtained with winter basal sprays of a mixture containing 2 lb. acid (¾ 2,4-D to ¼ 2,4,5-T) diluted to 10 gal.

1225. MATTHEWS, L. J. **Experiments in brush control.** *Proc. 3rd nat. Weeds Conf. N.Z.* 1950 (7–10). O.R.E.

2,4,5-T has been widely used in New Zealand to control Gorse (*Ulex europaeus*). Complete cover of all green parts with volumes of water not less than 100 gal./acre must be achieved in November–February. Applications are more effective when the Gorse is not flowering. The following recommendations are made: (1) seedling Gorse up to 3 ft. high—the BuEt ester of 2,4,5-T (i.e. 35·7% Bu ester plus 6·3% Et ester) at ¼–½ gal./acre; (2) Gorse regrowth up to 2 ft. high—the BuEt ester at rates up to 1 gal./acre; (3) Gorse still making growth—BuEt ester effective at 1 gal./acre only under optimum conditions; (4) Mature Gorse—results for all formulations are doubtful, but the best control has been secured by the volatile formulations of 2,4,5-T. On *Rubus fruticosus* under good spraying conditions (i.e. December–February) the tri-ethanolamine salt of 2,4,5-T at 1 gal./acre gives the best results. Under adverse spraying conditions the tri-ethanolamine salt gives no control. The esters applied in March have given a slow foliage kill with no re-growth up to date. In April and May the Blackberry appears quite resistant.

1226. BRODIE, A. **Experiments in chemical control of Gorse.** *Proc. 3rd nat. Weeds Conf. N.Z.* 1950 (21–4). O.R.E.

Trials on *Ulex europaeus* were made with (1) 1 gal. butoxy-ethanol ester formulation of 2,4,5-T

with 100 gal. water per acre; (2) 1 gal./acre 2,4,5-T ester formulation mixed with 50 gal. Dieselene; (3) Brush-killer with water at 100 gal./acre; and (4) Brush-killer with Dieselene at 50 gal./acre. The water-based sprays were more completely effective than the Dieselene-based ones, but (4) was satisfactory if applied in winter. (3) Was effective at all times of the year. Re-growth occurred on the 2,4,5-T-treated plots, but not on those treated with Brush-killer.

1227. ALTONA, R. E. **Seasonal spray treatments of *Stoebe vulgaris* with 2,4-D and methoxone.** *Proc. 1st Sth. Afr. Weed Control Conf. 1950*, 1951 (40–2). Witwatersrand University Press, Johannesburg. O.R.E.

S. vulgaris proved least resistant to weedkillers in early summer, but no complete eradication was achieved.

27. ARBORETA. ARBORICULTURE FOR ORNAMENTAL PURPOSES. HEDGES AND HEDGE PLANTS

See also Nos. 1212, 1361.

1228. DALLIMORE, W., and WOOD, R. F. **Guide to the national pinetum and forest plots at Bedgebury.** Forestry Commission, London. 1951. pp. 66 + 8 photos, 1 map. H.M. Stationery Office, London. Price 2*s.* 6*d.*

1229. SPITTA, M. W. **Highway planting in practice.** *Road International, London* No. 2, 1951 (36–43).

A short survey of the principles and practice of roadside planting in England, illustrated by photographs, some in colour.

1230. XIMENEZ DE EMBUN, J., and ARNAO, G. Árboles para caminos. [**Roadside trees.**] *Hoja divulgadora, Servicio de Capacitación y Propaganda, Ministerio de Agricultura, Madrid* No. 1–51*H*, 1951. pp. 16. [Span.]

Brief notes on trees suitable for roadside planting in Spain, and on methods of raising plants in the nursery and transplanting them for this purpose.

1231. MACCARIO, G. Un albero ornamentale dai frutti vistosi (*Koelreuteria formosana* Hayata). [**An ornamental tree with showy fruits (*K. formosana*).**] *Suppl.* to *Ann. Sper. agr.* (*n.s.*) 5 (3), 1951. pp. 6 + plate. [It.it.e.] C.G.B.

Account of its acclimatization at San Remo.

1232. HUME, E. P. **Some ornamental shrubs for the tropics.** *Circ. fed. exp. Sta. Puerto Rico* No. 34, 1951. pp. 151. 23 refs.

Describes with illustrations over 120 species, and includes an index of scientific and common English and Spanish names.

1233. THOMPSON, B. T. **Hydroganic tree feeding.** *Trees, Cleveland, Ohio* 11 (4), 1951 (22–3, 25). [Andrew Wilson, Inc., Springfield, N.J.]

Describes a method of injecting nutrients into the soil by the use of a power sprayer attached to a 'tree-feeding needle' a steel tube *ca.* 4 ft. long with a hard steel point at one end, two opposite $\frac{3}{16}$-in. outlet holes in the tube just above the steel point, and fittings at the other end to provide a handle and to permit the 'needle' to be attached by a cut-out valve to the hose from the spray tank. The organic-base fertilizer forms a suspension in the water, which must have a wetting agent added and be kept constantly agitated in the tank. The 'needle' is pushed about 6 in. into the soil, the valve is then opened, and the rush of water and fertilizer carries the 'needle' downwards to 18–24 in. or more as desired. The number of holes needed to feed a given tree depends on its size, allowing *ca.* 3 lb. of fertilizer per inch of d.b.h., and as many holes as there are lb. of fertilizer.

28. HUSBANDRY OF FOREST PRODUCTS OTHER THAN WOOD

282. *Bark Crops*

See also Nos. 885, 911, 1124, 1308, 1721.

1234. CABRAL, I. DE A. ROQUE. Ecologia do sobreiro—sua distribuição em Portugal—quadros da sua geoeconomia. [**Ecology of *Quercus suber*—its distribution in Portugal—its areas of economic importance.**] *Bol. Junta nac. Cortiça, Lisboa* 12 (144), 1950 (345–6); 13 (145), 1950 (13–6); 13 (149–50), 1951 (127–30; 157–62). 20 refs. [Port.]

1235. RYAN, V. A., and COOKE, G. B. **The Cork Oak in the United States.** *Publ. Smithson. Inst.* No. 3970, 1949 (355–76 + 11 photos, 1 map).

Cf. *For. Abstr.* 11 (Nos. 964–5).

284. *Crops Tapped for Exudations*

See also Nos. 1727 *et seq.*

1236. MAZEK-FIALLA, K. Vorläufige Versuche einer modernen wirtschaftlichen Fichtenflussharzgewinnung. [**Preliminary tests of an up-to-date resin-tapping technique for Spruce.**] *Mitt. öst. Ges. Holzforsch.* 3 (2), 1951 (12–6). 7 refs. [G.] P.R.

Analyses the Spruce-tapping methods of Kalnin and Splitter, and gives results of the author's own tapping technique on 320 trees of *ca.* 35 cm. d.b.h. with and without stimulants (25% HCl, 10% NaOH, Na_2SO_4, 10% NH_3, 4% NH_4F + NaF), for various depths of cut, distances between freshenings, and freshening intervals. The tapping season in Austria lasts from 1 June until 1 October. The yields (using the author's technique) vary widely (50–1,000 g. per face, sometimes reaching extreme values of 15 g. and 3,300 g.). The face was V-shaped, *ca.* 40 cm. long, and the resin flow was stimulated with chemicals. The yield per face decreased as the time interval between two consecutive freshenings increased, the greatest drop in yield being from freshenings made close together (10 mm.). Nevertheless this short distance is recommended, with a time interval of not more than 10 days, in order not to injure the tree unduly. The yield seems not to be affected by various depths of cut. The best stimulants are HCl and NH_3 (for 20 freshenings at 5-day intervals, the yield without stimulants was 320–540 g., with 25% HCl—700 g., and with NH_3—1,200 g.). The narrow cuts (author's technique) gave *ca.* twice as much resin as the broad cuts with the Piesting cutter (430 as compared with 200 g.). Trial tappings of Spruce stumps (after clear-cutting) gave 20–175 g. per freshening without stimulant, with a freshening interval of 10 days.

1237. Nájera y Angulo, F., and Rifé Lamprecht, M. P. Resinación con estimulantes químicos. Estudio general y experiencias realizadas en los pinares españoles. I. Ácido clorhídrico. [Resin tapping with chemical stimulants. General study and experiments in the Spanish stands. I. Hydrochloric acid.] [*Bol.*] *Inst. for. Invest. Exp. Madrid* 22 (54), 1951. pp. 112 + 34 photos. 52 refs. [Span.f.e.g.]

In 3 parts; (1) a historical review of the development of stimulation processes in Germany and their application elsewhere in Europe and in America, with a discussion of the theory involved. (2) A study of the chief factors involved in stimulation experiments, and a description of those undertaken in the Spanish Pine forests. (3) Spanish trials in tapping *Pinus pinaster* with the aid of HCl, using the Hugues or 'landes' tapping system. The following conclusions were reached: For continuous treatment of a normal face, 20% HCl should be applied for 75–80% of the season, to give an increased yield of 19–20%. For continuous treatment of a 'high' face 30–40% HCl should be used for 65% of the season to give an additional yield of 25–27%. For alternate treatment of a normal face (i.e. one freshening treated and one untreated) 30% HCl should be applied for 80% of the season to give an additional yield of 18–19%.

1238. Blieck. Rapport sur le gemmage à l'acide. [Report on tapping [*Pinus pinaster*] for resin [with chemical stimulation].] *Bois & Résin.* No. 1560, 1951 (1–2). [F.]

An interim report on large-scale experiments in the use of chemical stimulation in the Pine forests of the Landes. [Cf. *For. Abstr.* 11 (No. 2171).]

1239. Terzić, D. Smolarenje u Narodnoj Republiki B. i H. [Resin-tapping in the People's Republic of Bosnia and Herzegovina.] *Šum. List* 75 (1/2), 1951 (23–31). [Croat.russ.]

History of resin-tapping in this region before and during the war. Tapping on an industrial scale began in 1948, with 90% of faces on *Pinus nigra* and 10% on *Pinus sylvestris*. These two species form pure and mixed stands, and are found in almost equal proportions in the 21 forest management units where tapping can be conducted commercially. The French tapping method used gave *ca.* 300–350 g. crude resin per face per season (May–Oct.).

1240. Crivellari, D. Primi risultati di alcune ricerche sulle produzione di resina del pino d'Aleppo e del pino laricio. [First results of some research into resin production by Aleppo and Corsican Pines.] *Foreste* 2 (1), 1950 (107–16). 1 ref. [It.]

Cf. *For. Abstr.* 11 (No. 2174).

1241. Kazmi, S. M. A. Some observations on collecting Asafoetida or Hing [*Ferula* spp.]. *Pakistan J. For.* 1 (3), 1951 (229–33). 6 refs.

285. *Leaf Crops*

See also No. 1722.

1242. Chaudhuri, I. I. Some observations on the cultivation of *Atropa belladonna*. *Pakistan J. For.* 1 (3), 1951 (225–8). 6 refs.

Considers the possibility of cultivating this plant as undergrowth in the moist forests of the Murree hills.

1243. Ahmed, M. U. Golpatta. *Pakistan J. For.* 1 (1), 1951 (55–61).

A brief general account is given of the palm *Nipa fruticans*, which is an important source of roofing material in Bengal. Natural regeneration is usually by rhizomes. Several unsuccessful attempts at artificial regeneration are described. The author succeeded finally, using the following method. After collection, the seeds were kept in a fenced area on a clayey *char* (a newly formed alluvial shoal) where the tide daily ebbed and flowed. Under these conditions of alternate soaking and drying, germination started within a week, and was complete within a fortnight. As soon as the plants were 4–6 in. high (7–12 days) they were dibbled in at a 6 × 6 in. spacing in a *char* densely stocked with dhani grass. In these surroundings they were safe from deer, pigs, monkeys etc., which would not enter the long grass from fear of tigers, and 80–90% of seedlings survived. Usable fronds were first produced at an age of 3–6 years. Experiment showed that the method of harvesting which produced the best long-term yield of thatching material was that which left (1) all unopened fronds, (2) new fronds unsuitable for thatching, (3) the youngest usable frond, (4) young clumps with only one usable frond. The number of clumps flowering each year is *ca.* 5% of the total.

287. *Bamboo and Cane Growing*

See also Nos. 1178, 1263.

1244. Kadambi, K. On the ecology and silviculture of *Dendrocalamus strictus* in the Bamboo forests of Bhadravati Division, Mysore State, and comparative notes on the species *Bambusa arundinacea, Ochlandra travancorica, Oxytenanthera monostigma* and *O. stocksii*. *Indian For.* 75 (8–10), 1949 (1951), (289–99; 334–49; 398–426). 7 refs.

288. *Crops Grown for Animal Products*

See also Nos. 931–2.

1245. Sing, D. P. Forestry and bee-keeping in Kulu [Punjab]. *Indian For.* 77 (7), 1951 (474–5).

Gives some account of species of trees, shrubs and herbaceous plants important as bee pasture, and urges consideration of them in afforestation and conservation programmes.

1246. Demjanovskiĭ, S. Ja., Nefedova, V. A., and Kondratjeva, V. K. Kormovye svoistva listjev berezy, ispoljzuemyh dlja dubovogo šelkoprjada, v zavisimosti ot ee vida, vozrasta i uslovii obitanija. [Food value of Birch leaves used for rearing *Antheraea pernyi*, with reference to their species, age, and habitat conditions.] *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 16 (6), 1951 (41–3). 1 ref. [Russ.] A.P.B.

In May–July 1950, larvae of *A. pernyi* [cf. *For. Abstr.* 11 (No. 1051)] were fed on leaves of *B. verrucosa* and *B. pubescens* from 40- to 70-year-old trees and 6- to 10-year-old coppice; larvae fed on *Quercus robur* leaves were used as controls. The chemical composition (moisture, oven-dry weight,

total N, crude protein, ash, P, soluble carbohydrates, and aromatic substances) of leaves of all 3 species is tabulated. Their food value—as judged by length of larval life, weight of pupae and weight of silk cocoon—depended chiefly on species, but partly on site and age of tree. Best results were obtained with leaves of 40- to 70-year *B. verrucosa* grown on fertile sandy loam, which were practically equal to the Oak leaves in food value. Coppice leaves from the same site gave poorer results. The larvae preferred fully expanded leaves from the middle of the shoots to young apical leaves. The food value of *B. pubescens* leaves was lower, and when young they were not completely eaten, probably owing to the bitter taste and sharp odour imparted by an aromatic substance. *B. verrucosa* leaves from a rather swampy site, however, had a food value almost as low as that of *B. pubescens*.

3. HARVESTING OF WOOD, LOGGING AND TRANSPORT. RATIONALIZATION OF WORK; WORK STUDIES. FOREST ENGINEERING

31. LOGGING AND TRANSPORT: GENERAL

See also Nos. 885, 889, 1015, 1077, 1102.

1247. AVILA HERNANDEZ, M. Explotaciones forestales en el sureste de México. [**Forest utilization in southeastern Mexico.**] *Carib. For.* 12 (1), 1951 (37–46). [Span.E.]

A brief description of the forests, with a discussion of past methods of exploitation and measures in force and still required for future exploitation.

1248. STERNITZKE, H. S., and JAMES, L. M. **Arkansas timber stands before and after cutting.** *For. Surv. Release Sth. For. Exp. Sta.* No. 67, 1951. pp. 15.

Gives, in the form of graphs, data obtained from a survey of logging operations in 1949–50 on the kind of stands selected for logging, the size of tree cut, and the effect of cutting on the character of the stand.

1249. MCCOLL, B. J. **Developments in mechanical logging during 1951.** *Pulp Paper Mag. Can.* 52 (6), 1951 (142, 145, 147–50). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1147 (*B*–1).)

32. FELLING AND RELATED OPERATIONS

See also Nos. 1082, 1270, 1548, 1699.

1250. BROMLEY, W. S. **An economical method of marking timber.** *J. For.* 49 (7), 1951 (518–9).

The men are provided with marking rules, and keep record of the number of trees marked, but not a complete tally; at the end of each week a field check and volume summary of the marking should be made.

1251. **The chemical killing of trees to facilitate bark removal.** Northeast Pulpwood Research Center, Gorham, N.H. 1951. pp. 14 + 10 photos, 1 dgm. P.R.

Presents the results of the Armstrong Forest Company's observations during their Western Pennsylvania operations in May, 1950. The method used is based on the principle that the tree to be harvested must be killed during the period of rapid growth when the dividing cells in the cambium layer are weakest and most easily subjected to rupture and deterioration. The following chemicals were used: Na_3AsO_3, the '2,4-D' compounds, Ammate (weed-killer), NaOH, and urea, with 4 methods of application. The best killing and peeling results were obtained with an Na_3AsO_3 solution.

1252. REISSINGER, G. Eine neue Fäll- und Astaxt. [**A new axe for felling and lopping.**] *Forst u. Holz* 6 (15), 1951 (222–3). [G.]

The chief advantage of the new 'Iltis' axe, which is described, is its very thin blade, which can be easily sharpened without the use of a motor-driven whetstone.

1253. HASUO, Y. **Some experiments on the cutting performance of a chain saw, Fuji Industrial Co., Ltd., Mitaka Plant.** *J. Jap. For. Soc.* 30 (1/2), 1948 (1–11). [Jap.e.]

The performance, e.g. power consumption, speed of cut, of 4 types of cutting teeth are reported in graphs and tables.

1254. **New power saw carrier designed for safety.** *Trees, Cleveland, Ohio* 11 (4), 1951 (13).

The Aerial Power Saw Carrier (illustrated) now being manufactured by the LeRoy Machine Co., Inc., LeRoy, N.Y., provides a means of hoisting a power saw, as well as safely supporting its weight while in use. Whether the operator is aloft in a tree or standing on the ground, he can let go of the saw while he changes position, and it hangs free until he is ready for another cut; when cutting, he has only to guide the saw. The carrier consists of a steel plate with sharp-pointed prongs that grip the tree; a crane arm to hold the carrier away from the tree and permit it to swing through a wide arc; a tension spring attached between the end of the crane arm and the pulley through which the hoisting rope is reeved; a clamp to attach hoist to saw, and another hand-operated clamp attached to the hoisting rope, to hold and adjust the position of the saw. A flexible cable passing through the spring, provides a safety device in case the spring breaks. The carrier is adaptable to either a petrol-driven or an electric saw.

1255. HEYDEN. Neuartige Bindung. [**A new type of link.**] *Forst u. Holz* 6 (13), 1951 (190–1). [G.]

Describes a link made of 3 iron rings designed to hold the legs of a makeshift log trestle for use in cross-cutting, barking and other operations in the forest.

33. DEGREE OF UTILIZATION AND WASTE. CLEARING THE FELLING SITE

See also Nos. 1091–2, 1175, 1307.

1256. [BENSON, A. W. B.] **Logging waste in eastern Canada.** *Timber of Canada* 11 (12), 1951 (31–3).

A field study was carried out on 12 sawlog and veneer-log operations in eastern Ontario and south-western Quebec during summer 1950. The study comprised the measurement of logging waste (stumps, long butts, tops and uncut trees) on a total sample area of 10 acres, in $\frac{1}{10}$-acre plots distributed as uniformly as possible over the area studied. Ten of the stands were of mixed softwoods and hardwoods, the other two of Black Spruce and Jack Pine. The average waste amounted to 17·5% for softwoods, 48·9% for hardwoods and 25·4% on the Black Spruce and Jack Pine stands. For all operations studied, the average waste recorded was 30·3% of the usable material. On the 10 acres of the sample plots, the original stand showed an average of 17,195 bd. ft./acre, and the waste was at the rate of 5,137 bd. ft./acre. Similar studies are planned for other parts of Canada.

1257. SCHICK, H. **Stump removal—Pontiac style.** *Trees, Cleveland, Ohio* 11 (4), 1951 (24). [Parks and Recreation Department, Pontiac, Mich.]

Soil is dug away to a depth of one foot all round the stump, bark chipped off with an axe and large interfering roots chopped through, and the stump is then sawn off with a 20-in. chain saw. On stumps of 3-ft. diameter and over, a 4-ft. chain is used, and a 2-ft. clearance for the motor is dug half round the base of the stump. When there is a danger of resprouting, a mixture of one pint of 2,4-D in 3 gal. of kerosene is painted on the remains of the stump, and this appears effectually to prevent coppice growth. The hole is then filled in and grass sown over it. [Cf. *For. Abstr.* 13 (Nos. 350, 1307).]

1258. McKee, R. G. **Slash problems in British Columbia.** *Proc. West. For. Conserv. Ass.* 41, 1950 (54–5).

1259. Phipps, D. L. **Oregon's proposals for slash disposal.** *Proc. West. For. Conserv. Ass.* 41, 1950 (53–4).

1260. Jeffers, D. S. **Results of studies on slash disposal in Idaho White Pine [*Pinus monticola*].** *Proc. West. For. Conserv. Ass.* 41, 1950 (56–7).

Brief outline of a long-term research project and of the first year's results.

1261. Ash, L. W. **Paper-covered piled slash.** *Fire Control Notes* 12 (3), 1951 (18–9).

Describes a successful experiment in covering piles of slash with waterproof kraft paper, to protect them against excessive moisture until they could be safely burnt without danger of fire spreading. Cost was 4¾ cents per 6 × 8 ft. pile.

1262. Berwick, E. J. H. **The removal of standing Rubber on coastal clays.** *Malay. agric. J.* 32 (4), 1949 (298–303 + 6 photos). 3 refs. L.S.

Felling of old standing Rubber by two methods is described, (1) by means of a stumper on a Caterpillar D8 tractor, and (2) by means of a wire cable between two heavy tractors. Heaping and burning, and rooting are also described. The presence of root disease in the standing Rubber, and the susceptibility of the crop to be planted in its place, will influence the methods of felling to be adopted, and a table is given to show the susceptibility of the main crops in Malaya (Rubber, Coconut, Oil Palm, Tea, Cacao and Hemp) to the common root diseases, *Fomes noxius*, *F. lignosus*, *Ustulina zonata*, *Ganoderma pseudoferreum*, and *Sphaerostilbe repens*.

1263. Mayne, J. E., and Jamil, M. B. **An unusual problem in land clearing.** *Trop. Agriculture, Trin.* 27 (7/12), 1950 (231–5). A.P.B.

Describes operations in which a Caterpillar D-7 tractor with an angledozer was used to clear an old Bamboo plantation. Methods of uprooting, burning, disposing of the Bamboo, and of rough levelling and drainage are described, and an estimate of the operating costs is given. *From authors' summary.*

35. RATIONALIZATION OF WORK. WORK STUDIES

See also Nos. 885, 1253–4, 1270, 1787.

1264. Yatagai, M. **Studies of forest labour in Hokkaido. (1) Labour conditions in winter logging.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (1–28). [Jap.]

A detailed local analysis of each phase of the work. The need for mechanization is stressed.

37. TRANSPORT

See also No. 910.

1265. Wibstad, K. **Industrivirkets transportproblemer. [Problems of transport for industrial [small] wood.]** *Norsk Skogind.* 5 (7), 1951 (217–22). [Nor.e.] P.R.

An analysis of the production and transport of small wood (with a volume of less than 0·10 cu.m.) showed that it could be handled and transported most economically when cut into standard lengths (3 m. length is recommended, with a minimum top diameter of 5 cm.). The transport cost of unbarked wood, because of greater volume, is 15% higher than that of barked wood. If unbarked wood cannot be satisfactorily seasoned and is classed as green timber, transport costs will be increased by a further 25% for lorry and 50% for rail transport. Little information is available on floating standard 3-m. lengths, but the short, light lengths should allow good drying out, thus reducing sinking. It is recommended that wood should be sold to buyers in bundles of a given volume rather than by number of pieces. Types of lorry and trailer are discussed, and road conditions and transport costs in Sweden and Norway are compared.

372/377. *Land Transport*

1266. Kameke, C. von. Grundlagen und Verfahren des Holztransportes im Oberharz. **[The principles and methods of timber transport in the Oberharz.]** *Mitt. Bundesanst. Forst- u. Holzw.* No. 21, 1950. pp. 55 + 8 + 2 photos, 1 dgm., 1 gph., 10 tbls., 1 map. 21 refs. [G.g.]

A degree dissertation. The author stresses the homogeneity, throughout the whole of the Oberharz, of conditions affecting the transport of round timber. For short leads horse-drawn vehicles are still in use, but for longer distances motor transport is increasingly used. Loading platforms are essential for improving the loading output. The rationalization of timber transport in Oberharz is discussed from the point of view of the timber industry, hauliers, and forest management.

1267. Collins, T. E. **The Berger-Rees air-tong loader.** *Circ. Inst. For. Prod. Wash.* No. 11, 1951. pp. 7.

Describes, with illustrations, the loader, which is an adaptation of the dipper-stick type of power shovel, and is claimed to give greater safety, reduced loading time, greater ease in handling small material, and simplified maintenance.

1268. Lovrić, N. Neka dizala kod primjene skidera. **[Some log-loading devices used with skidders.]** *Šum. List* 74 (12), 1950 (487–98). 6 refs. [Croat.eroat.]

Describes (with illustrations) an American (Skagit Steel and Iron Works) and some U.S.S.R. [cf. *For. Abstr.* 11 (No. 2893)] log-loading devices.

1269. Gimon, P. Une expérience d'exploitation forestière en Guyane française. **[An experiment in**

forest exploitation in French Guiana.] *Bois For. Trop* No. 17, 1951 (26–32). [F.e.span.]

Describes the use of a 2-drum Heller winch mounted on a Cletrac caterpillar tractor, for skidding and loading in dense tropical forest where the use of tractor and arch is not practicable.

1270. SHAW, R. G. **Machinery research.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (92–3).

A headquarters Mechanical Development Committee was formed in Sept. 1949, and a programme of investigation into the use of mechanical methods in the forest was drawn up and agreed. Notes are given on preliminary tests of tractors, cableways and chutes. It is already clear that for economic operation of cableways, two conditions must be met: (1) the time required to transfer the cableway from one site to another must not exceed one day, employing 5 men; (2) at least 3,000 cu. ft. must be available to the cableway. Preliminary trials with light aluminium chutes in 8-ft. sections have been encouraging.

Two types of one-man power saw have been tested in the field. The results suggest that their weight, time required for maintenance and starting, and the need for frequently replenishing the fuel, render them unsuitable for selective felling of trees under 9 in. in diameter.

1271. WILSON, R. F. **Extraction of thinnings.** *Emp. For. Rev.* 30 (2), 1951 (156–7 + 1 photo).

The author discusses the problems arising from the extraction of relatively small quantities of small thinnings. Where conditions permit the use of horses or wheeled tractors with sulkies, this appears to be the most economic method. On slopes where this is impracticable, the best solution would be a powered aerial cableway, which could be speedily erected, easily operated, and quickly dismantled. [Cf. preceding abstract.]

1272. PESTAL, E. Entwicklung und Aufgabe der Seilkrantechnik in den Alpen. **[Development and purpose of the cableway crane technique in the Alps.]** *SchrReihe öst. Ges. Holzforsch.* No. 2, 1950 (42–50). [G.] P.R.

1273. JANČO, J. Drótový šmyk. **[Gravity cableway.]** *Pol'ana* 6 (12), 1950 (260–5 + 5 dgms.). [Slovak.]

A detailed and illustrated description of a gravity cableway (equipment, tightening devices, grips, windlass, upper and lower anchorage, assembly and dismounting). Cableways have been used experimentally in several places in Slovakia. The following figures refer to cableway transport of tanbark (Racibor, October, 1950): lead 120 m.; drop in height 25 m.; slope 12°; time required for (*a*) assembling the cableway, 36 min., (*b*) changing the upper anchorage, 30 min., (*c*) loading, transport and unloading of each consignment (60 kg.) 4 min. 12 sec. The use of gravity cableways in Slovakia is strongly advocated.

1274. KLANJŠČEK, V. Nove vrste žičnic-spuščalk. **[New types of gravity cableways.]** *Gozd. Vestn.* 8 (5), 1950 (139–48). [Sloven.croat.e.]

Illustrated description of a primitive type of gravity cableway for the extraction of small timber. The supports are simple wrought-iron stirrups which are attached by short chains, intended to allow for horizontal deviations from a straight cable line. The carriages—simple pulley-blocks with single hooks—get 'derailed' about once in 3 days. Unloading from the carriers is done by the usual method of a short rail, which is erected above a loading platform, and to which the carriages are diverted from the fixed cable. With cables of 14–18 mm. diameter the maximum loads carried are 500 kg. Only one cableway is mentioned as being actually in operation, in Slovenia.

38. FOREST ENGINEERING

383. *Roads and Bridges*

See also No. 1183.

1275. WEBB, B. E. **Road-making in Johore.** *Malay. Forester* 14 (2), 1951 (60–6 + 2 photos).

Methods and costs of making a permanent road through a forest reserve.

1276. SIMÓN Y DE SIMÓN, E. DE. Vias de saca en la Sierra de Cazorla. **[Roads for the extraction of forest products in the Sierra de Cazorla.]** *Montes, Madrid* 7 (39), 1951 (172–8). [Span.]

1277. MCLEOD, N. W. **Pavement for logging roads.** *Pulp Paper Mag. Can.* 52 (7), 1951 (178, 180, 183). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1188 (*B*–8–*b*).)

Discusses the methods and materials used in laying the subgrade, base course and surface of asphalted logging roads.

1278. MASANI, N. J. **Simple calculations in the design of forest bridges of stock spans of 15, 20, 30, and 40 feet. V (c) (Stress diagm. method).** *Indian For.* 77 (8), 1951 (517–36).

[Cf. *For. Abstr.* 12 (No. 3333).] Separate copies of the entire series as a set of 5 parts can be obtained from the Forest Research Institute, Dehra Dun.

385. *Drainage, Irrigation, Sedimentation. Water Supply*

See also Nos. 1185, 1188, 1263.

1279. LINDBERG, K. Modern skogsdikning. **[Modern forest drainage.]** *Svenska SkogsvFören. Tidskr.* 49 (1), 1951 (67–80). [Sw.]

Trials of draining with explosives were made in 2 districts in Norrland and 1 in central Sweden. The work, begun in early June, was carried out by crews of 2, and later of 3 men. Charges of 50–100 g. were inserted in crowbar holes at distances of 15–40 cm. at about half the depth required for the drain, and the end charge was detonated, the other charges being touched off by detonation waves. The most important factor proved to be the moisture in the soil; in one stretch, an average of 54 failures per 100 m. occurred because the soil was too dry. In dry soil, the distance between charges must be reduced to 15 cm. and there will still be failures. Draining water down into the charge holes, or filling them by hand, are possible methods of treating dry stretches. Results showing the numbers of m.

blasted, the nature of the soil, estimated costs per m. for manual labour, and actual costs per m. for blasting, and the number of failures per 100 m., are tabulated. Estimated savings in cost range from –5% on the lightest to 41% on the heaviest soil, and savings in time from 77 to 82%. The cost of explosives (including transport, fuses, etc.) is considerably more than that of labour, the ratios (in % of the total cost) being 64/36, 70/30, and 72/28 for Jörn, Åsele and Grönbo respectively. Figures of the relative time for the different operations show that cleaning out the drains after the explosion and preparing the charge holes take longest, each taking roughly 30% of the total time, except in Grönbo, where cleaning takes 41%. In theory, there is no limit to the length that can be blasted at a time, but in practice only about 50 m. can be cleaned out after the explosion before water starts to flow into the drain. Differences in cost between teams of 2 and 3 men were slight, and a 3-man team is recommended for safety in areas crossed by roads or busy footpaths. Some of the equipment used (a special crowbar for making charge holes, apparatus for inserting the charge, a container for carrying the dynamite on a bicycle and another with a rucksack-type tubular steel frame for ground where a bicycle cannot go, and an electric detonator) is briefly described. The question of estimating a fair price when the work is offered for contract is discussed. [Cf. *For. Abstr.* 10 (No. 2193).]

4. FOREST INJURIES AND PROTECTION

See also Nos. 885, 1100–1.

41. GENERAL TECHNIQUE OF FOREST PROTECTION. TYPES OF INJURY

See also No. 967.

411. *Natural and Biological Control*

See Nos. 1329–30, 1363, 1374, 1376–7, 1385, 1399, 1400, 1402–3, 1405–6.

414. *Chemical Control*

280. SCHINDLER, U. Über den Einsatz von Rückenspritzen in den nordwestdeutschen Forstrevieren. **[Operations with knapsack sprayers in the forest districts of northwest Germany.]** *Forst u. Holz* 6 (13), 1951 (185–8). [G.]

Describes and discusses the performance of 4 types of German commercial knapsack sprayers.

42. INJURIES FROM INORGANIC AGENCIES OTHER THAN FIRE

421. *Air Currents*

See also Nos. 1036, 1081.

281. VITÉ, P. Methode und Ergebnis einer Sturmschadenkartierung im Lehrforstamt Bramwald (Oberweserbergland). **[Methods and results of mapping storm damage in the experimental forest district of Bramwald (Oberweserbergland).]** *Forstwiss. Cbl.* 70 (5), 1951 (336–46). 11 refs. [G.g.]

Spruce was taken as the standard in estimating the intensity of storm damage, and reckonings were based on past records of damage and the influences of air currents and soils. As a result it was possible to draw up a map of the area showing 3 grades of danger zone: (1) with unfavourable soil conditions and greatly exposed to storms, (2) with favourable soil conditions, but greatly exposed to storms and, (3) with unfavourable soil conditions but less exposed to storms.

422. *Temperature Influences. Frost. Heat. Drought*

See also Nos. 1023, 1048, 1121, 1149, 1499.

282. DAY, W. R. **The susceptibility to injury by experimental freezing of strains of European Larch (*Larix decidua* Mill.) of varying geographical origin.** *Forestry* 24 (1), 1951 (39–56). 12 refs.

The paper describes fully a series of experiments in freezing in a refrigerator, which show frequent, significant differences in degree of damage between Larch of different provenances. If latitude is held constant, there is a fairly high and significant positive correlation between state of flushing and amount of injury. When elevation is held constant, there is a significant negative correlation between amount of injury and latitude. The corresponding correlation with elevation, latitude being held constant, is not significant. There is evidence that provenances vary in relative hardiness at different times during the early part of the growing season. Field observation suggests that most of the serious injury to European Larch occurs during March and early April, and that therefore provenances which when grown in Great Britain are relatively hardy during the late winter and early spring are those likely to be most suited to its climate. The work was carried out with too few provenances for anything more than general suggestions to be made, but results confirm what is observed in the field: in spite of the poor results often obtained hitherto, further work might show that there are strains in the Alps relatively good for growing in Great Britain, though the most reliable strains are likely to be of British origin with, probably, those from the Sudeten mountains or Poland as next best. *From author's summary.*

1283. GEIGER, R. Die Waldgefährdung durch den Dürresommer 1947. **[Damage to forests [in Germany] during the dry summer of 1947.]** *Forstwiss. Cbl.* 70 (6), 1951 (349–55). 12 refs. [G.]

1284. **[*Pinus caribaea* killed by drought.]** *Rep. For. Dep. S. Rhod. 1950*, 1951 (12).

P. caribaea at Mtao Forest Reserve, which died from drought, has been clear felled. A few trees remain, and it is noteworthy that *P. caribaea* adjoining Eucalypts remain healthy.

423. *Precipitations*

1285. GALOUX, A. Les dégâts de neige en forêt. **[Snow damage in the forest.]** *Bull. Soc. for. Belg.* 58 (7/8), 1951 (281–90). 12 refs. [F.]

A general discussion.

1286. LAMBERT, J. Dégâts de neige en Ardenne. **[Snow damage in the Ardennes.]** *Bull. Soc. for. Belg.* 58 (7/8), 1951 (290–300). [F.]

Analysis of the damage caused in the winter of 1950–51. [Cf. *For. Abstr.* 12 (No. 3342), 13 (No. 379).]

424. *Soil Conditions. Erosion Effects*

See also No. 1023.

1287. HUNT, F. M. **Effects of flooded soil on growth of Pine seedlings.** *Plant Physiol.* 26 (2), 1951 (363–8). 3 refs. O.R.E.

Pinus echinata, *P. taeda* and *P. rigida* var. *serotina*, were planted in cans filled with sandy soil above a layer of gravel, and were subjected to the following flooding treatments: (1) flooded continuously with standing water, (2) flooded with flowing water, and (3) alternately flooded for 2 weeks and kept at field capacity for 2 weeks. After 12 weeks the only effect was a slightly reduced rate of growth in the seedlings continuously flooded with standing water. After 12 weeks the soil in half the containers from each treatment was allowed to dry down to permanent wilting point and then re-watered to field capacity. The cycle was repeated for 7 months with little effect, except that those seedlings flooded with running water during the first 12 weeks made less growth than the other groups. The plants continuously flooded with standing water had a

lower dry weight than those receiving other treatments. No significant difference in mortality occurred. In general the seedlings proved highly resistant to injury by flooding. *From author's summary.*

425. *Chemical Influences (Atmospheric)*

1288. WHITE, L. T., and LINZON, S. N. **Preliminary report on the condition of White Pine in the Sudbury sulphur-fume area.** Dominion Laboratory of Forest Pathology, Toronto. 1950. pp. 26.

Deals mainly with the methods employed to compare increment, mortality, regeneration etc., on sample plots within 25 miles of the smelting works and at a greater distance. Regeneration was significantly less on the former.

426. *Electrical and Cosmic Influences*

See Nos. 1292–3.

43. FOREST FIRES

1289. BARROWS, J. S. **Forest fires in the northern Rocky Mountains.** *Sta. Pap. Nth. Rocky Mt. For. Range Exp. Sta.* No. 28, 1951. pp. 251 + 6 photos, 3 maps. 11 refs.

A report on an analysis of 36,000 forest fires, covering their occurrence within the region, the behaviour of fires in different conditions of topography, fuel and weather, and their effect and control.

431. *Predisposing Factors and Causes. Fire Danger. Fire Behaviour*

1290. BRUCE, D. **Fuel weights on the Osceola National Forest.** *Fire Control Notes* 12 (3), 1951 (20–3).

Measurements were made of small fuel (less than 1 in. in diameter) in the Longleaf/Slash Pine type. Dense Pine stands had on an average 4 tons/acre more than open stands. For all densities and all types of ground vegetation, there were about 5½ tons/acre more fuel on 10- to 15-year-old roughs (regrowth after early burning) than on 1-year roughs. The presence of Palmetto (*Serenoa repens*) or Gallberry (*Ilex glabra*) added another 2 tons/acre.

1291. BUCK, C. C. **Inflammability of chaparral depends on how it grows.** *Misc. Pap. Calif. For. Range Exp. Sta.* No. 2, 1951. pp. 2.

As the result of drought since 1945, many bushes have died, more old leaves than usual have fallen, and there has been little if any growth of new leaves. The higher ratio of dead to green fuel, the inflammability of the foliage, higher fuel temperatures from increased exposure to the sun, and more freedom for wind movement close to the ground, have abnormally increased the fire danger in the South Californian chaparral.

1292. BARROWS, J. S. **Lightning fires in the Northern Rocky Mountains.** *Fire Control Notes* 12 (3), 1951 (24–8).

Data from 25,000 lightning fires were transferred to punched cards. Some of the preliminary results of the analysis are summarized.

1293. FRIEDRICH, C. A. **Forest fire—thunderstorm: knockout combination for watersheds.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 102, 1951. pp. 15.

Describes and reproduces photographs to illustrate the erosion damage caused by heavy summer thunderstorms in 1950 on a watershed burnt by a lightning fire a year earlier.

1294. ORELL, B. L. **Fire weather forecasting in the State of Washington.** *Proc. West. For. Conserv. Ass.* 41, 1950 (33–5).

1295. FAHNESTOCK, G. R. **Correction of burning index for the effects of altitude, aspect, and time of day.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 100, 1951. pp. 4 + 12 tbls.

Presents burning-index conversion tables for the area surrounding the Priest River Experimental Forest in Northern Idaho, for calculating differences caused by time of day, aspect and altitude, for up to 8 hours after the time of measurement.

1296. BYRAM, G. M., and NELSON, R. M. **The possible relation of air turbulence to erratic fire behaviour in the Southeast.** *Fire Control Notes* 12 (3), 1951 (1–8). 5 refs.

Evidence from forest fires in S. Carolina during the spring of 1950 indicates that erratic fires in the south-east of the U.S.A. may have some common characteristics. The following tentative conclusions are drawn:—Fires with erratic behaviour are most likely to occur on sunny days when there is strong surface heating and light or moderate winds. Erratic fires have a tendency to develop one or more violent whirls after reaching a certain critical size (possibly between 20 and 75 acres). From the air, the size of larger whirls appeared to remain fairly constant and to cover an area of *ca.* 10 acres. After becoming established, the whirls can apparently move rapidly away from the main fire and take the direction of the light wind prevailing at the time. Field men state that most of the worst fires occur on days with a S.W. wind. This indicates a characteristic pressure system that may also account for some of the turbulence. Observers in aircraft have noticed that the air was always bumpy on days when whirling fires occurred. Turbulence may have a pronounced effect on a fire long before it reaches the whirling stage. It was noticed that on days when there was high turbulence, even small fires burned with strong draughts. The opposite of this has long been familiar to fire-fighters: fires usually undergo a pronounced change in behaviour in late afternoon and evening when the atmosphere becomes more stable. This change has often been attributed to the increase in relative humidity that accompanies the drop in temperature of the lower air levels, but it is possible that an increase in air stability may have as great or greater influence on behaviour than a combination of increased fuel moisture and decreased fuel temperature.

1297. **Protection from fire.** [*Bienn.*] *Rep. Stheast. For. Exp. Sta.* [1951] (2–3).

A tree crown at a temperature of 40° F. on a cold day requires about 2½ times as much heat to reach the lethal temperature of 140° as a tree crown at 100°

on a hot sunny day. Initial vegetation temperature may be an important factor in early burning for hardwood control. Loblolly stands in which the underside of the tree crowns is 50 ft. or more above the floor can usually be burnt in hot weather without crown scorching. Other studies, results of which are tabulated, demonstrated that the height of the scorch line in a Pine stand increases with initial crown temperature, even though fire intensity remains constant.

Headfires, near the ground, are not so hot as backfires; headfires spreading before a light wind are hotter near the ground than those spreading before a strong wind. Backfires spread faster against a strong than against a light wind. On 5 pairs of headfire and backfire test plots, mortality of 2- to 3-year Longleaf Pine seedlings was 57% on the backfire and 35% on the headfire plots.

Fire resistance of Longleaf Pine is attributed to the high heat resistance of the buds, their downy layer of insulating tissue and the dense protecting sheath of needles. In the hottest zone, buds ¼ in. in diameter on vigorous seedlings have a temperature rise of *ca.* 35°; in smaller seedlings of low vigour the rise is more than double the figure. Mortality of Longleaf between 6 in. and 4 ft. in height is caused by girdling at the base of the stem, not by bud injury. [Cf. *For. Abstr.* 10 (No. 2223).]

432. *Prevention and Control*

See also Nos. 889, 1312–4.

1298. STEWART, D. W. R. **Some aspects of fire control in Western Australia.** *Emp. For. Rev.* 30 (2), 1951 (172–8 + 2 photos).

1299. GORRIE, R. M. **Patana fires in estates and water catchments.** *Trop. Agriculturist, Ceylon* 106 (3), 1950 (122–3). O.R.E.

The gradual replacement of patana grasses by trees appears to be the only solution of the problem of fire control in the patana lands of Ceylon. The author recommends *Leucaena glauca* for the hotter and lower grasslands, and *Acacia decurrens* for land in the mist belt, or anywhere above 3,500 ft. For middle elevations and land not too badly eroded *Alstonia scholaris* should be suitable; it would provide a good supply of fuel if managed on a short coppice rotation of 6–8 years. Contour trenches 30–35 ft. apart, 1½ ft. deep and 2 ft. wide at the bottom, should be dug with the soil built up into a broad, flat berm on the downhill side of the trench. Seed or transplants should be placed towards the top of the berm.

1300. **Fire control.** *Rep. For. Dep. N. Rhod. 1950*, 1951 (7).

Seven sq. miles of scrub Rhodesian Teak [*Baikiaea plurijuga*] forest were divided by series of firebreaks of different patterns, and the area was fired in the hot dry season in September. It was found that no type of break capable of stopping a forest fire altogether could be constructed at an economic cost, but a cleared break 200 yd. wide with the internal part burned under control each season, slowed down the impetus of the fire sufficiently for control to be possible.

1301. CHORLTON, R. W. **The preparation of visible area maps by field sketching.** *For. Fire Res. Note For. Br. Can.* No. 16, 1951. pp. 16. 12 refs.

Describes the method and equipment used for preparing maps by field sketching from a given fire-detection point.

1302. EVERTS, A. B. **A skyline fire extinguisher.** *Fire Control Notes* 12 (3), 1951 (44–6).

The extinguisher is essentially a 100-gal. water tank of heavy steel, pressurized by a 15-lb. CO_2 cartridge. For operation it is only necessary to crack the CO_2 valve and open the hose-line valve.

1303. WEBSTER, L. T. **The use of mobile pumper units in fire suppression.** *Proc. West. For. Conserv. Ass.* 41, 1950 (42–4).

1304. **Effect of altitude, length of hose line, and head on performance of forest fire pumping units.** *For. Fire Res. Note For. Br. Can.* No. 13, Suppl. 3, 1951. pp. 7.

Cf. *For. Abstr.* 12 (No. 2315).

1305. **Ejection suction booster.** *Fire Control Notes* 12 (3), 1951 (14–7).

Discusses the choice of an eductor or ejection suction booster to suit local conditions. By using an eductor properly designed for the pumping unit, water can be pumped from a stream or reservoir 100 ft. below the level of the fire truck, or from sources 300 ft. from possible access because of soft ground, fences etc. The output of pumpers can be increased considerably for filling the tank where lifts are 70 ft. or less. Where lifts are only 15–20 ft., pumpers can use local water sumps and deliver two or three times the pump capacity on to fires at low pressure. Further details on the Ejector Suction Booster project and information on makers and details of eductors that can be used with pumpers up to 30 gal./min. at 250 lb./sq. in. are available at the Arcadia Equipment Development Centre, 701 N. Santa Anita Av., Arcadia, Calif.

1306. WALKER, R. O. **Hose testing and drying rack.** *Fire Control Notes* 12 (3), 1951 (12–3).

Describes lay-out and arrangement of rack for washing, testing, and drying fire hose, used at the regional fire cache, Portland, Ore.

435. *Benefits of Fire Control. Injurious Effects of Fire. Fire Losses*

See Nos. 911, 1093, 1297.

436. *Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry*

See Nos. 911, 1048, 1091–2, 1095, 1124, 1175, 1261, 1290, 1297, 1394.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

441. *Weeds*

See also Nos. 1002, 1145–7, 1207–9, 1213, 1224–7, 1251, 1257, 1785.

1307. MELANDER, L. W., *et al.* **Control of woody plants.** *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (227–70). O.R.E.

[Cf. *For. Abstr.* 13 (No. 399).] Summarized reports are presented from organizations situated over a wide range of territory in the U.S.A. and Canada (i.e. including Texas, California and other areas outside the North Central region). A good deal of work has been done on resistant species, and some success obtained. *Rosa* sp. sprayed in 1949 with 2,4,5-T (Weedone Brush Killer 32) at a dosage of 4,000 p.p.m. was killed in all those parts that were completely covered at the stage of full leaf development. *Populus tremuloides* was better controlled when treated during the full-leaf stage than in the early succulent stage (*J. F. Alex* and *R. T. Coupland*). Blackbrush (*Acacia amentacea*) proved resistant to foliage sprays of 2,4,5-T esters and amines, and to combinations of 2,4-D and 2,4,5-T esters in oil solutions and emulsions (*R. A. Darrow*). Solid stands of *Symphoricarpos occidentalis* growing on sites ecologically adapted to them, proved resistant to esters of 2,4-D, as did also *Rosa* sp. growing with *Elaeagnus commutata*. In the latter case the destruction of *E. commutata* encouraged the *Rosa* to overrun the entire area (*M. R. Kilcher*). Good control of *S. occidentalis* in pasture was obtained, however, by spraying with the ester formulations of 2,4-D at rates of 1·5 lb. and 2 lb. acid per acre at the pre-bud stage (*H. W. Leggett*). Dormant-season treatments of *S. orbiculatus* with esters of 2,4-D and 2,4,5-T in Diesel fuel gave disappointing results. Basal applications of 2,4-D and 2,4,5-T to *Fraxinus lanceolata* during the dormant season, killed trees 3 in. and over in diameter but was less successful in killing coppice shoots from stumps (*G. L. McCall* and *J. W. Zahnley*). *Maclura pomifera* was completely destroyed by spraying cut stumps with a mixture of 2½% 2,4-D plus 2½% 2,4,5-T in Diesel oil (*D. L. Klingman*). Painting freshly cut stumps (12–15 in. high) of *M. pomifera* with the pure ester of 2,4,5-T, alone or mixed in equal parts with 2,4-D, was also successful (*J. W. Zahnley* and *G. L. McCall*). Satisfactory kill of *Berberis canadensis* has been obtained with 10,000 p.p.m. of a 2/1 mixture of 2,4-D and 2,4,5-T in an oil solution with pentachlorophenol added as a penetrant. Year-round sprays are considered effective and practical for initial operations. Good results were also obtained with $NaClO_3$ and $NaClO_3$/borax (*L. W. Melander* and *W. M. Watson*). *Berberis fendleri* is now being killed at all seasons of the year with formulations of 2,4-D and 2,4,5-T. An emulsion containing 2,000 p.p.m. of 2,4-D ester is used as a summer foliage spray, and a 1½% oil solution of a 2 to 1 mixture of 2,4-D and 2,4,5-T plus a penetrant, is used as a dormant spray in the autumn, winter and spring (*L. W. Melander* and *E. A. Lungren*). Young *Aesculus glabra* var. *sargentii* trees, which are poisonous to cattle, can be killed by thorough spraying with the triethanol amine salt of 2,4,5-T in water at 4,000 p.p.m., or with 2,000 p.p.m. isopropyl ester of 2,4-D (*J. W. Zahnley* and *G. L. McCall*).

Basal and ground-line treatments of dormant shrubs, sprouting stumps and trees with 2,4-D and 2,4,5-T in oil solutions, have given good success in many cases; it is important to cover the base of the plants thoroughly. Esteron Brushkiller containing an acid equivalent of 2 lb. per gal. each of 2,4-D and 2,4,5-T mixed with a 2% solution of fuel oil and sprayed on the base of stems of *Populus tremuloides* and *P. grandidentata* to a height of about 4 ft., produced an effective top kill when applied during the period of full foliage development (*J. L. Arend*). *Acacia farnesiana* was successfully controlled by monthly basal treatments with kerosene and Diesel fuel in mid-winter and early summer (*R. A. Darrow*). Basal sprays of *Alnus incana* and *Acer rubrum* were 90–100% effective when 2,4,5-T esters in Diesel oil at 5,000 p.p.m. were applied at a rate of 60 gal./acre. Concentrations of 8,000 p.p.m. were 100% effective, whereas a concentration of 20,000 p.p.m. 2,4-D was required for 100% kill. A tractor-sprayer combination was used with success in dense Alder stands at the Dunbar Forest Experiment Station, Michigan, though some modifications in constructional detail are recommended (*M. W. Day*). Basal sprays of 2,4-D and 2,4,5-T respectively were more successful in Diesel oil than in water on *Populus deltoides* (*D. L. Klingman et al.*). Leafing and coppicing of *Maclura pomifera* in the next growing season were successfully prevented by basal sprays of mixtures of 5,000 p.p.m. 2,4-D ester plus 5,000 p.p.m. 2,4,5-T ester in Diesel fuel (*V. W. Woestemeyer*). Basal spraying of *Diospyros virginiana* early in March with 4 or 8%, on an acid basis, of the esters of 2,4,5-T, seemed to give a complete kill (*J. W. Zahnley* and *G. L. McCall*). Basal sprays of *Quercus* spp., *P. tremuloides*, *P. grandidentata* and *Acer rubrum* were more effective when applied in spring when the buds begin to open than at any other time of year (*J. L. Arend*).

Brush consisting mostly of small Hickory [*Carya* sp.] 2–4 in. in diameter was successfully treated with 20,000 p.p.m. of 2,4-D and 2,4,5-T mixed in equal parts (*A. L. Bakke* and *D. W. Staniforth*). Materials containing mixtures of 2,4,5-T and 2,4-D applied at a rate of 4 lb. acid equivalent per acre gave complete kill of Blackberry canes (*L. M. Josephson*). *Aloysia ligustrina* gave a positive reaction to 2,4-D, 2,4,5-T, and a mixture of both, when they were applied as foliage sprays at a time when the plants were in a good state of physiological activity (e.g. shortly after rain) (*W. G. McCully*). *Corylus americana* in a stand of mature Red Pine was successfully treated with sprays of the new volatile butyl esters (Dow) of 2,4-D, 2,4,5-T and a 50/50 mixture of these in water solution. All summer sprayings of this species (except in mid-June and some in early July) were equally successful. Concentrations of 2,400 and 4,800 p.p.m. at rates of 44–60 gal./acre gave equal success. A 54% kill of *Ledum groenlandicum* in a swamp was obtained with the low volatile butyl ester (Dow) of 2,4-D at 38,400 p.p.m. and a dosage of ca. 115 gal. solution/acre. Other bog shrubs showed less resistance than *L. groenlandicum* to 2,4-D and 2,4,5-T alone and in combination (*E. I. Roe*). *Condalia obtusifolia* can be controlled by sprays of an emulsion mixture of the esters of 2,4-D or the amine or ester of 2,4,5-T at concentrations of 1%, during the active growing stage. A 1% solution of a combination of the esters of 2,4-D and 2,4,5-T or the ester of 2,4,5-T in oil is an effective spray at any time of year. High pressures and fairly high volumes are necessary (*D. W. Young* and *C. E. Fisher*).

In tests on Willow a 100% kill with only 7% regrowth in the following season resulted from November sprays with the butyl-ester formulation of 2,4-D in Diesel oil at a rate of 5 lb. acid equivalent in 40 gal. oil/acre. The best effects were obtained by spraying the lower half of the tree (*C. C. Butler*).

2,4,5-T was more lethal than 2,4-D to Hawthorn [*Crataegus* sp.] and *Acer saccharinum* (*L. L. Coulter*). December basal sprays of 5% 2,4,5-T in kerosene of Diesel oil were successful on *Diospyros virginiana*. A combination of 2½% 2,4-D with 2½% 2,4,5-T applied in frills during August–February was better than either formulation alone (*W. C. Elder* and *J. E. Gassaway*). 2,4,5-T esters gave satisfactory control of Prickly Pear (*Opuntia lindheimeri*) in Texas when applied as a drenching spray in oil or oil emulsions. Complete kill of clumps up to 4 ft. high and 6–8 ft. diam. was obtained with 0·5% acid concentration of butyl and isopropyl esters in oil solutions (*R. A. Darrow*). An 80% kill was also obtained with a 9% solution of TCA [trichloracetate], ¼ to ½ pint of the solution being applied to each clump (*R. D. Hamilton*).

Foliage sprays on *Quercus stellata* and *Q. marilandica* were unsuccessful but good results were obtained with: (1) dormant season basal treatments with diesel fuel solution containing 2% acid equivalent of 2,4-D isopropyl ester; (2) spring basal treatments with 2% acid concentrations of 2,4,5-T esters or 3% 2,4-D and 2,4,5-T esters in combination; (3) dormant-season and early-spring cut-surface treatments with isopropyl ester of 2,4,5-T and combinations of 2,4-D and 2,4,5-T esters at 1·2–1·5% acid concentrations (*R. A. Darrow*). 2,4-D compared more favourably with 2,4,5-T on the same spp. when used in frills but the best results in frills were obtained with 2,4,5-T. All frilled trees appeared dead where concentrations above 2% 2,4,5-T or where 1% 2,4,5-T with 2% 2,4-D were applied during August–April. For trees up to 5–6 in. diam., 20–30 c.c. of solution per tree were used. The best basal treatments were those applied in December and March. Top kill was quicker in the frilled trees (*W. C. Elder* and *J. E. Gassaway*). Dormant and foliage spraying of Blackjack and Post Oak from aircraft has been tried by the Stillwater College of Agriculture, Okla., but without conclusive results (*H. W. Elwell* and *W. C. Elder*). Good control of *Q. marilandica* resulted from January basal treatments with the amines of 2, 4-D and 2,4,5-T in water, containing 8% acid (weight to volume) (*H. W. Elwell* and *G. L. McCall*).

Esteron 44, Esteron 245 and Esteron Brushkiller in 2% water solutions by volume were all successful in killing *Comptonia peregrina* at a dosage of 47 gal./acre (*L. C. Engle* and *J. W. Buerge*).

Mesquite [*Prosopis juliflora*] has been effectively and economically controlled by aircraft applications of 2,4,5-T at 2–3 lb. acid/acre during the first heavy foliage stage. The most effective ground control of Mesquite can be obtained by removing the top wood and spraying the stumps and cut surfaces thoroughly with a solution of 1 lb. 2,4,5-T ester in 20 gal. Diesel oil or kerosene. Small trees and coppice growth may be sprayed during the full foliage stage with 1 lb. 2,4,5-T in enough water or oil to cover 1 acre. Good top kill and some root kill have also been obtained by spraying the lower branches and trunks in summer with 1 lb. 2,4,5-T ester in 20 gal. Diesel oil (*D. W. Young* and *C. W. Fisher*).

A table summarizing the reactions of woody species to formulations of various chemicals is appended.

1308. BEARD, J. S. **The woody weeds of Wattle plantations. Some recent experiments on their eradication.** *Proc. 1st Sth. Afr. Weed Control Conf. 1950*, 1951 (33–9). 6 refs. Witwatersrand University Press, Johannesburg. O.R.E.

Control of *Rubus* sp., *Solanum auriculatum* and *Lantana camara* in Wattle plantations is important if the trees are not to be rendered inaccessible by dense thickets. Some experiments conducted by the Natal Tanning Extract Co., Ltd., Pietermaritzburg, are reported. On *Rubus* sp. the cheapest and most promising spray was 19 oz. mixed 2,4-D and 2,4,5-T acids (2 parts 2,4-D to 1 part 2,4,5-T) per acre in 100 gal. water. On *S. auriculatum* 2,4-D sprays gave good results when ¾–1 lb. acid/acre in 100 gal. water was used. For the larger trees the same amounts of acid in 25 gal. Diesel oil proved a successful basal spray. *L. camara* has so far proved resistant to 2, 4-D and 2,4,5-T, but uprooting of the bushes by mules, followed by a 2,4-D oil spray, would probably be effective. [Cf. *For. Abstr.* 12 (No. 1562).]

1309. OFFORD, H. R., MOSS, V. D., and QUICK, C. R. **Killing *Ribes* with 2,4-D and 2,4,5-T. Spraying and fogging *Ribes* by helicopter with 2,4-D and 2,4,5-T.** *Abstr.* in *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (246–7). O.R.E.

Tests were made to examine the possibilities of cheap broadcast spraying of forest land over a period of 5 years or more, instead of 1 or 2 more costly treatments. Basal sprays have so far proved better than foliage sprays. 5% of 2,4-D or 2,4,5-T (or 2·5% of each) in Diesel oil, fuel oil, kerosene oil, or stove soil, applied during April–October to the basal stems, killed 90% or more of *Ribes*. Broadcast spraying was quickest with a power sprayer equipped with the pecan-type orchard gun. The axial-flow power blower was used effectively to kill *Ribes* and brush along roadsides by applying 1% solutions of 2,4,5-T ester (1% summer oil added) in two runs from opposing directions. The fishtail nozzle was used for work within 15 ft. of the machine, and the oval nozzle for getting distribution and good coverage out to a distance of *ca.* 66 ft. An examination of plots of *R. viscosissimum* and *R. lacustre* sprayed by helicopter in 1949, showed that 1 lb./acre 2,4,5-T acid (isopropyl ester) in 10 gal. diluent (10% summer oil emulsion) was the cheapest and best treatment. In May 1950 preliminary tests were made in California of a thermal fogging device installed in a helicopter, for applying low dosages of 2,4-D to *Ribes* and White Pine. Six oz. of the acid (the low-vapour-pressure ester of 2,4-D, butoxyethanol) per acre showed nearly 100% defoliation of *Ribes* in open, light and medium brush cover, without much damage to Pines. Brush cover providing more than 50% shade seemed to protect

the *Ribes* from the full effect of the fog. [Cf. *For. Abstr.* 13 (Nos. 404, 1341).]

1310. MINSHALL, W. H. **Eradication of Poison Ivy (*Rhus radicans* L.). V. The effect of foliage removal prior to treatment on the control of Poison Ivy by applications of ammonium sulfamate and 2,4-dichlorophenoxyacetic acid.** *Sci. Agric.* 31 (3), 1951 (127–30 + 1 plate). 5 refs. O.R.E.

Three types of plot—(1) uncut, (2) cut in June of the current year, and (3) cut in June of the previous year, were sprayed in July with 10% NH_4 sulphamate and also with 0·1% 2,4-D acid with carbowax as co-solvent. Good control was obtained with NH_4 sulphamate on all types of plot. With 2,4-D a good control was obtained in plots of type (2), but poor control in (3) and even poorer control in (1). The greater effect in the cut plots was probably due to the greater effect of 2,4-D on the younger leaves. [Cf. *For. Abstr.* 13 (No. 403).]

1311. KUNTZ, J. E., and RIKER, A. J. **Chemical control of weed competition in forest plantations.** *Abstr.* in *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (242–3). O.R.E.

Herbicides were applied in early spring to circular areas 27 in. in diameter round dormant Cottonwood cuttings recently planted at a 5 × 5 ft. spacing on both ploughed and unploughed plots. In unploughed unweeded control plots tree survival was less than 10% and growth less than 6 in. With clean cultivation over the entire area on ploughed plots survival was more than 80% and growth over 5 ft. On ploughed plots where weed control was confined to the circular areas, tree growth was about half that on the clean-cultivated plots. A mixture of 2,4-D (isopropyl ester 5 lb./acre, spray) and trichloracetate (TCA–NH_4 and Na salts, 25 lb./acre, spray) gave good control with no apparent injury to the trees. Almost as good were TCA alone (25 and 50 lb./acre), a mixture of 2,4-D and isopropyl-phenyl-carbamate (IPC) emulsifiable oil, 16 lb./acre, and a mixture of 2,4-D and Chlorosol-A (80 lb./acre). $NaClO_3$, polybor chlorate and NH_4 sulphamate, all injured or killed the trees.

1312. KUNTZ, J. E., RIKER, A. J., and THOMAS, J. E. **Chemical weed control in forest fire-lanes.** *Abstr.* in *Res. Rep. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (241–2). O.R.E.

Possibilities of chemical weed control in fire-lanes were explored in central Wisconsin. Original weed stands and re-growth were both more common in rototilled than in non-rototilled fire-lanes. Spring applications were more successful than autumn ones. Applied in spring, Borascu (10 and 20 lb. per square rod, dry), concentrated borax (10 lb. per square rod, dry), a mixture of 2,4-D (isopropyl ester, 5 and 10 lb./acre, spray), and TCA (NH_4 and Na salts 25 and 50 lb./acre) have all given encouraging results for at least one season. Polybor chlorate (5 and 10 lb. per square rod, dry) did almost as well.

1313. CHORLTON, R. W. **The use of certain chemicals as vegetation eradicators and soil sterilizers.** *Fire Res. Leafl. For. Br. Can.* No. 6, 1951. pp. 3 + 2 tbls.

Experiments were made in the use of $NaClO_3$ and two Diesel oils (A.P.I. 20°–26°, and A.P.I. 26°–32°), to kill and prevent regrowth of herbaceous vegetation on cleared firebreaks (both ploughed and unploughed). Diesel oil (A.P.I. 26°–32°) was the most effective as a soil sterilizer, giving an effective firebreak for 3 years, but in addition to being expensive, this treatment considerably increases the inflammability of vegetation. If, however, care is taken to confine the spray to the ploughed portion of the firebreak, this will not be a serious obstacle to its use; it was found that fire would not spread in earth given this treatment.

$NaClO_3$ in a 10% solution was a fairly effective soil sterilizer for 2 years. This solution, which is cheaper than Diesel oil, also increases the inflammability of vegetation. The addition of $CaCl_2$ to $NaClO_3$ more than offset the latter's inflammability, but at the same time reduced its toxic effect to a point where it no longer produced an effective firebreak.

1314. SIMSKIĬ, A. M. Podnovlenie protivopožarnyh zaščitnyh polos himičeskimi veščestvami. **[Maintenance of firebreaks with the aid of chemicals.]** *Lesn. Hoz.* 1950 (5), (69). [Russ.]

Recommends spraying with 30% aqueous solutions of $CaCl_2$, $(NH_4)_2SO_4$ or ammonium phosphate, with the addition of 1% of a wetting agent, 'Kerosene contact' ('sulpho-naphthenic' [naphthol-sulphonic?] acid), at 0·1–0·5 litre/sq. m., to keep firebreaks free from weeds. The treatment, which has a combined herbicidal and fire-retardant effect, is best applied on fine, warm days in early spring. To prevent loss of the chemicals by leaching, a fixing agent should be sprayed on as soon as visible droplets of the first spray have disappeared, e.g. (1) for $CaCl_2$, liquid naphthenic soap; (2) for $(NH_4)_2SO_4$, $BaCl_2$; (3) for ammonium phosphate, $ZnCl_2$. These should be applied in 5% aqueous solution at 0·05–0·25 litres/sq. m.

1315. JONES, I. E. **The control of riverbed growth in South Canterbury.** *Proc. 3rd nat. Weeds Conf. N.Z.* 1950 (16–20). O.R.E.

Includes a report of work on the control of Willows. Frilling with application of 2,4-D has proved successful on larger trees. Sucker growth has been successfully eliminated by felling the saplings and clearing the roots with a bulldozer and root rake, with subsequent sprays of 2,4-D at 2 lb. acid equivalent/acre in 100 gal. water.

1316. BUCKLEY, T. A. **Notes on the control of trees and weeds by phytocides.** *Malay. agric. J.* 34 (1), 1951 (27–31). O.R.E.

Deals briefly with the most important weeds of Malaya and the methods currently used to control them.

1317. HARTLEY, C. W. S. **An experiment of mechanical methods of lalang eradication.** *Malay. agric. J.* 32 (3), 1949 (236–52 + 4 photos). L.S.

Describes an experiment in which heavy sheet lalang [*Imperata cylindrica*] in an exposed situation was successfully eradicated by disk and mouldboard ploughs, heavy disk-harrows, and a rotary cultivator. Though no significant differences were shown between these 4 treatments, there was an indication that ploughing was more consistently effective. A

final cultivation with a straight-line cultivator significantly reduced the amount of lalang that survived. Costs of mechanical cultivation varied from M $34.80 to 55.61/acre, but with suitable tractors and implements, eradication could be carried out for costs as low as M $20–25/acre (including depreciation etc.).

In a small trial in which eradication of lalang was attempted with various numbers of weekly sprayings with Na_2HAsO_3 and varying numbers of cultivations with a rotary cultivator, it was shown that spraying before cultivation was more effective than cultivation before spraying. *From author's summary.*

1318. KEEPING, G. S., and MATHESON, H. D. **Mechanical spraying for the eradication of lalang.** *Malay. agric. J.* 32 (3), 1949 (253–9 + 2 photos). 2 refs. L.S.

Costs of spraying Na_2HAsO_3 solution for the control of lalang [*Imperata cylindrica*] can be reduced by the use of mechanical sprayers. Data are given on the performance and costs of spraying with: (1) Allen motor scythe and spraying attachment; (2) Gravely tractor with spraying attachment; (3) Bristol tractor with Hardie pump, and tank from Gravely tractor; and (4) Bristol tractor with 200-in boom sprayer.

1319. GUPTA, J. N. S. **The growing menace of Assam-lota (*Eupatorium* spp.) [in Bengal] and how to combat it.** *Indian For.* 75 (9), 1949 (1951), (351–3).

443. *Fungi and Bacteria*

1320. PEACE, T. R. **Forest pathology.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (76–83).

Notes are given on diseases of a number of species; breeding of rust-resistant strains of *Pinus strobus*; and raising of *Thuja* in isolated nurseries in order to obtain seedlings free from *Keithia thujina*. The Sycamore disease which suddenly appeared in Essex [cf. *For. Abstr.* 11 (No. 1465)] has been found to extend into Kent, Surrey and Middlesex. The causal fungus, which has not yet been identified, has also been found as a saprophyte on fence posts.

1321. GROSSBARD, E. **Antibiotics and microbial antagonism in plant pathology.** *Endeavour* 10 (39), 1951 (145–50). 17 refs.

A review article.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 1149–50, 1366.

1322. TROŠČANIN, P. G. Ustoičivostj sejancev sosny v geografičeskih posevah. **[Resistance of Pine seedlings in sowings of different provenances.]** *Lesn. Hoz.* 1950 (5), (79–81). 1 ref. [Russ.]

From 1936 onwards, *Pinus* seedlings (*P. sylvestris* and *P. banksiana*) in various nurseries in the Tartar A.S.S.R. suffered mass attack by a disease caused by *Sclerotinia graminearum*, the chief symptom of which was drooping and casting of the shoot apex at the slightest movement, the break occurring 1–3 cm. below the terminal bud, and revealing at this point a sclerotium 4–4·5 mm. long and 1·5–2·5 mm. broad. At the Zelenodolsk nursery, where the disease was first noted, about 80% of the seedlings were affected. Seedlings were usually not killed and showed good survival when planted out in the forest. In spring 1946 a similar attack occurred in various nurseries in Bryansk Province. One of these nurseries contained seedlings of *P. sylvestris* from 12 different regions, which were destined for provenance trials. Here it was observed that seedlings of northern provenance were generally much less susceptible to the disease than those of more southerly provenances.

443.3. Diseases of Older Stages

See also No. 1499.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 972–4, 1078–9, 1262, 1386, 1411–2, 1652.

1323. STEWART, D. M. **Heart rot of Black Ash in Minnesota.** *Phytopathology* 41 (6), 1951 (569–70). 4 refs.

A first record in Minnesota of this heart rot due to *Polyporus hispidus*. It is characterized by conspicuous black lines bordering the apparently sound and the decayed wood.

1324. AOSHIMA, K. **Studies on *Fuscoporia obliqua* (Pers.) Aoshima, comb. nov., a wood-rotting fungus of Birch.** *Bull. Tokyo Univ. For.* No. 39, 1951 (185–207 + 8 photos). 30 refs. [Jap.jap.e.]

Cultural studies were made on 6 strains of the fungus from different localities in Japan, 2 from Canada and 2 strains of *Polyporus glomeratus* from Canada. The cultural characteristics of the Japanese and Canadian strains were identical, and differed from those of *P. glomeratus*. The author considers that European mycologists have used the name *Poria obliqua* to cover this fungus, *P. glomeratus* and *Poria andersonii*. The name *Fuscoporia obliqua* is proposed. Results of the cultural studies are tabulated. Tests show that sapwood and heartwood of Birch spp. are rapidly destroyed, but that the heartwood of conifers (e.g. *Cryptomeria japonica* and *Chamaecyparis pisifera*) is extremely resistant. *F. obliqua* does not fruit until the host tree is completely rotten and falls to the ground. It is therefore desirable to remove any infested trees so as to prevent dispersal of the spores.

1325. NORDIN, V. J. **Decay in Sugar Maple in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (3), 1951 (2).

Investigations showed that 109 fungi occur on living trees, slash, or debris of *Acer saccharum*, but only 28 species were observed to cause decay in living trees, and of these, 12 accounted for 97% of the volume of decay attributed to known organisms; *Armillaria mellea* and *Polyporus glomeratus* were the most important butt and stem rots respectively. Several pathogens not previously associated with decay of Sugar Maples in Ontario were *Corticium vellereum*, *Fomes fraxineus*, *Hericium laciniatum*, *Peniophora* sp., *Pholiota spectabilis*, *Polyporus adustus*, and *Polyporus tulipiferus*. Sugar Maples are infected at an early age; a decay incidence of more than 65% occurred in trees 40–80 years of age.

1326. NORDIN, V. J. **Decay of Yellow Birch in Nova Scotia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (3), 1951 (1).

Fifty-three trees of Yellow Birch of various sizes and suffering from different degrees of die-back, were felled and examined. Secondary decay organisms were not found on trees slightly affected, but in the more serious cases a number of decay fungi were found in the crowns—*Fomes fomentarius, F. pinicola, Ganoderma applanatum, Lenzites betulina, Polyporus albellus, P. betulinus, P. pergamenus*, and *P. versicolor*. Decay of heartwood was negligible except in trees with a diameter greater than 9 in. In these larger trees heart-rot due to the following fungi was discovered—*Fomes igniarius, Poria obliqua, Armillaria mellea*, and *Ustulina vulgaris*. Heart-rot due to *U. vulgaris* was also discovered for the first time in a Horse Chestnut.

1327. KHAN, A. H. **Some diseases observed in the Teak plantations of East Bengal.** *Pakistan J. For.* 1 (3), 1951 (209–12). 3 refs.

Notes on rust caused by *Uredo* (*Olivea*) *tectonae*, and a root rot caused by an unidentified *Polyporus* sp.

1328. RUDD JONES, D. **Other tree diseases.** *Rep. E. Afr. Agric. For. Res. Organ. 1950*, 1951 (28).

At Rau Forest near Moshi, Tanganyika, young trees of *Chlorophora excelsa* were found to be infected by *Helicobasidium compactum*. Incidence of the disease and the heavy mortality were thought to be associated with a high watertable. Trees of the same species in a neighbouring plantation were being killed by *Fomes noxius*.

1329. RISHBETH, J. **Observations on the biology of *Fomes annosus* with particular reference to East Anglian Pine plantations. III. Natural and experimental infection of Pines, and some factors affecting severity of the disease.** *Ann. Bot.* 15 (58), 1951 (221–46 + 1 plate). 14 refs. O.R.E.

F. annosus normally invades sound and not damaged roots. In small roots the wood is often entered soon after the bark. In roots more than 0·3 cm. in diameter *F. annosus* colonizes the bark to a greater extent before entering the wood. Alkaline soils favour the latter type of infection. The number of infections of living roots is greater in alkaline soils than in acid ones. Invasion may be checked by resin production, and to a lesser extent, by meristematic activity. Resistance of Pines to killing increases with age. Trees at the extreme edge of plantations show a greater resistance to disease than those on the inside. Experimental infections were carried out on Scots Pine to study factors affecting attack. *F. annosus* invaded weakened or severed roots far more readily than normally healthy ones, and roots of younger trees more readily than those of older ones. Roots of young Pine were more resistant when watering was heavy than when it was restricted or where trees received rainfall only. Some environmental factors affecting severity of outbreak were studied also, and a method of estimating the severity of the disease on former woodland sites is described. The disease is less severe where there is a relatively large amount of superficial organic matter, and more severe where the soil is alkaline. This arises partly from the difference in soil mycoflora. Both *Penicillium* sp. and *Trichoderma viride* are more abundant in acid soils of former woodland and *Calluna* heath. The antagonism of *T. viride* to *F. annosus* is an important factor. [Cf. *For. Abstr.* 13 (No. 426).]

1330. GARRETT, S. D. ***Fomes annosus* in East Anglian Pine plantations.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (124–5). [School of Botany, Cambridge University.]

Experiments are in progress to protect stumps from *Fomes* infection by inoculation with a harmless competing fungus, *Peniophora gigantea*. Inoculation has been effected (1) by driving in wedges of wood infected with *Peniophora*, and (2) by spraying with a suspension of *Peniophora* basidiospores. If this method of biological control should prove effective, the cost need not be prohibitive, since the first batch of stumps inoculated with *Peniophora* would provide ample inoculum for later fellings, and the process would become a continuous one.

1331. WHITE, L. T. **Studies of Canadian Thelephoraceae. VIII. *Corticium galactinum* (Fr.) Burt.** *Canad. J. Bot.* 29 (3), 1951 (279–96). 37 refs. P.R.

During an investigation into the decays of White Pine in certain regions of Ontario it was found that the fungus, *Corticium galactinum*, was important as an organism destroying woody material in the roots and butts of living trees. Because of the increasing interest in this species, its early history and the literature on its pathogenicity to roots of Apple trees as well as other hardwood and coniferous species have been reviewed. A revised description, based on the study of a portion of the type specimen from the Fries herbarium and a comparison with specimens from Apples and coniferous species, is presented. The taxonomy and relationships of *C. galactinum* are discussed. Detailed comparison is made with *C. odoratum* and a description of that species is included. Cultural studies show that *C. galactinum* is heterothallic and of the tetrapolar type of interfertility and may possess multiple allelomorphs at the loci responsible for heterothallism. *From author's summary.*

1332. RHOADS, A. S. ***Clitocybe* root rot of woody plants in the southeastern United States.** *Circ. U.S. Dep. Agric.* No. 853, 1950. pp. 25. 33 refs.

Root rot caused by *Clitocybe tabescens* is a destructive disease of woody plants in the S.E. United States; it is easily confused with that caused by *Armillaria mellea* [cf. *For. Abstr.* 8 (No. 1408)]. In Florida it has been recorded as attacking 210 species belonging to 137 genera and 59 families. The fungus may live a saprophytic existence for years, but is also capable of virulent parasitism and can attack uninjured roots of vigorous plants and spread to adjacent ones through root contact. Infected Oak and other hardwood roots left in the ground at the time of clearing have been found to infect trees and shrubs planted after a much longer lapse of time than is generally believed likely. In Florida the disease has been found to occur most frequently in well drained, light, sandy soils that are dominantly acid in reaction; it is much less common in neutral soils and does not occur at all on limestone soils. This and the fact that the disease

occurs sometimes on land that has been cleared for many years and is free from old roots, indicate that some factor or factors other than the presence of infected roots in the ground are involved in its incidence.

Surgical treatment and exposure of the root crown have proved effective in combating the disease. Banking the soil to a point well above the partially girdled bases of treated trees to stimulate the development of new root systems from the callus formed at the margin of the living bark, has been found to expedite the recovery of trees greatly weakened by loss of roots and partial girdling. *From author's summary.*

1333. MOREAU, M., and MOREAU, C. Une grave affection nouvelle de la forêt française: la maladie de l'encre du chêne. [**A serious new disease in the French forest: ink disease of Oak.**] *C.R. Acad. Sci., Paris* 232 (24), 1951 (2252–3). [F.] O.R.S.

Phytophthora cinnamomi, which has been isolated from a diseased tree, is considered to be the primary cause of the ink disease attacking *Q. borealis*, *Q. robur* and *Q. tozza* in the south-west of France. Three species of *Nectria* were also isolated. [Cf. *For. Abstr.* 11 (No. 2351).]

Wilts, Diebacks etc.

1334. SARAVÍ CISNEROS, R. El marchitamiento de los pinos provocado por *Diplodia pinea* Kickx en la provincia de Buenos Aires (Argentina). [**Dieback of Pine caused by *D. pinea* in the province of Buenos Aires, Argentina.**] *Revista de la Facultad de Agronomía, La Plata* 27 (Fasc. 2), 1950 (163–79). 26 refs. [Span.span.e.] A.P.B.

Observations on the pathogen, first recognized in Argentina in 1946, its geographical distribution and symptoms of attack. The fungus directly attacks buds, shoots and leaves, and is capable of killing new growth in successive years until the plant dies. Twigs and branches are also attacked through wounds. Inoculation tests showed that 8 out of 9 *Pinus* species were susceptible, viz. *P. radiata*, *P. halepensis*, *P. pinea*, *P. pinaster*, *P. caribaea*, *P. sylvestris*, *P. canariensis* and *P. thunbergii*. Only *P. palustris* seemed to be resistant. Control can be effected by 3 or 4 spring sprayings of 1% Bordeaux mixture with soap.

1335. LEKANDER, B., MATHIESEN, A., and RENNERFELT, E. Om almsjukan samt råd och anvisningar för dess bekämpande. [**Dutch Elm disease and notes on its control.**] *Flygbl. Skogsforskn-Inst., Stockh.* No. 65 [1951]. pp. 7. [Sw.]

The first certain identification of the disease in Sweden was made at Stockholm in spring 1950, and reconnaissance has shown that it is generally distributed in the Stockholm area. Further records have come from the ports of Kalmar and Norrköping. This distribution suggests that the fungus was introduced in imported Elm wood, and at Göteborg imported wood was found which bore numerous fruiting bodies, though the disease has not yet been detected in this locality. Imports of Elm plants, bark, or unbarked wood, are now prohibited under a regulation of 12 January 1951. The present pamphlet briefly summarizes information, from European and American sources, on the fungus and its dispersal by barkbeetles, symptoms of disease, and control measures directed against the vectors, stressing also the importance of disinfecting pruning tools etc., and requesting that specimens from trees suspected of infection be sent to the Swedish Forestry Research Institute. [Cf. *For. Abstr.* 13 (No. 1367).]

1336. FOWLER, M. E., and BRETZ, T. W. **Airplane surveys for Oak wilt.** *Abstr.* in *Phytopathology* 41 (6), 1951 (561).

The location of Oaks attacked by *Chalara quercina* proved quick and economical when surveys were made from low-flying aeroplanes. The diseased trees were distinguishable by the bronzing of the leaves.

1337. **Sapstreak disease.** [*Biennial*] *Rep. Stheast. For. Exp. Sta. 1949–50* [1951] (16).

This disease, caused by *Endoconidiophora virescens*, has killed large numbers of Sugar Maple in the Pisgah National Forest. Methods have been found to prevent its spread by lumber from diseased trees shipped out of the area. Boards from trees with heavy internal streaking were air-dried only, air dried and treated with Permatox 10 S (pentachlorophenol), and kiln dried. Results of isolations from these boards showed that under ordinary summer conditions at Asheville neither spores nor mycelium remain viable as long as 2 months. Treating with Permatox 10 S prevented surface fruiting completely, and kiln drying killed the fungus on the surface and in the wood. Thus air drying, kiln drying, or pentachlorophenol treatment, appear to render sapstreaked wood relatively safe for shipment.

Cankers, Stem Rusts etc.

See also No. 1346.

1338. RUDD JONES, D. **Canker disease of Cypresses caused by *Monochaetia unicornis*.** *Rep. E. Afr. Agric. For. Res. Organ. 1950*, 1951 (25–8).

Further studies in the canker disease of Cypresses in Kenya caused by *Monochaetia unicornis* have shown that infection is facilitated by misty weather. The effect of wind in spreading spores will now be studied. The cankers start to elongate about a month after the long rains have begun. In severe attacks, the cracking and drying out of the cankered tissue in the dry season may produce complete ring-barking and the death of the tree. The much greater susceptibility of *C. macrocarpa* than of *C. lusitanica* has now been confirmed over a wide range of sites, and there would appear to be good reasons to abandon the planting of the former. Study of the fungus in culture showed that there are two distinct strains, one virulent, fast-growing, and producing few spores, the other less virulent, slow-growing, but a copious spore-producer. [Cf. *For. Abstr.* 12 (No. 2347).]

1339. NATTRASS, R. M. **A *Botrytis* disease of *Urena lobata* in Kenya.** *E. Afr. agric. J.* 16 (4), 1951 (181 + 7 photos). 2 refs.

A plot of *U. lobata* at Nairobi was attacked by a severe stem-canker disease, the causal agent of which was identified as *Botrytis cinerea*, already

known to occur in Kenya as a disease of *Eucalyptus* spp. [cf. *For. Abstr.* 11 (No. 678)]. In every instance it appeared that the cankers originated at one of the nodes, each of which has a flower bud or cluster in the leaf axil, and that infection occurred through the flower bud, a circumstance believed not to have been previously recorded.

1340. MÜLDER, D. Neue Grundlagen für eine rationelle Abwehr des Kienzopf (*Peridermium pini*). **[New principles for the rational control of *P. pini*.]** *Forstwiss. Cbl.* 70 (6), 1951 (369–95). 15 refs. [G.]

Presents in detail the results of investigations of *P. pini* in Pine stands near Oldenburg. Three lines of investigation were followed: (1) the influence of the age of the stand upon the spread of the disease, (2) the independent nature of each particular infected area, and (3) the part played by inherent predisposition to infection in the tree. The results are presented in detail. Up to the age of 30 years only 1–5% of trees are attacked, and infected trees have only an average of 1–2 infected areas. The peak of infection occurs about the age of 35 years, when some 25% of the stand may be infected, with an average of 6 infected areas per tree. The predisposition of individual trees to infection, rather than proximity, is the deciding factor in the distribution of the disease in the stand, although the dominants tend to become most quickly affected. After the peak, the infection declines rapidly but the results manifest themselves more gradually and with varying promptitude from stand to stand. From the silvicultural point of view it is important to maintain the density of the stand up to and past the period of peak infection. Up to the age of 30 years no account need be taken of infected trees when making thinnings, but after the peak is reached the stand must be constantly and carefully watched for infected and damaged trees, and these preferred for removal when thinning. The fusiform appearance of infected branches affords the best means of recognizing diseased trees. [Cf. *For. Abstr.* 10 (No. 2240).]

1341. **White Pine blister rust and Barberry eradication in the Western States.** [Division of Plant Disease Control, U.S. Bureau of Entomology and Plant Quarantine.] 1950. pp. 7.

Account of the work already done to eradicate *Ribes* spp. and *Berberis* spp. [Cf. *For. Abstr.* 13 (No. 1309).]

Foliage Diseases

See also No. 1327.

1342. **[Aspen an alternative host to Pine rust.]** *Rep. For. Comm. Lond. 1949/50*, 1951 (42).

A serious outbreak of *Melampsora pinitorqua* on Scots Pine has pointed to the inadvisability of growing this species when Aspen, the alternative host to the fungus, is present.

1343. DEMETRIADES, S. D. La rouille du peuplier en Grèce. **[Poplar rust in Greece.]** *Annales de l'Institut phytopathologique Benaki, Athens* 4 (1/2), 1950 (50–2). 7 refs. [F.] I.M.I.

Records for the first time in Greece the occurrence of *Melampsora allii-populina* on *Populus nigra*.

1344. BOLLI, M. Influenza dei raggi ultravioletti sull'oidio della quercia. **[The influence of ultra-violet rays on Oak mildew.]** *Ann. Fac. Agr. Perugia* 2, 1943 (65–8). 3 refs. [It.] C.G.B.

A number of 2-year-old Oak seedlings grown in pots were inoculated with *Microsphaera quercina*. Half of them were subjected to ultra-violet radiation for 5 min. on the 1st day, 10 on the 2nd and 3rd, and thereafter for 15 min./day until the 36th day after inoculation, by which time they were only slightly affected with the disease, whereas controls were badly diseased. In another experiment, 2-year-old seedlings were subjected to ultra-violet radiation for 15 min./day for 27 consecutive days, after which both they and controls were inoculated with *M. quercina*; 45 days later, the controls were all badly diseased, but the treated plants showed only very slight symptoms. It is suggested that the relative immunity to mildew of Oaks growing above 400–500 m. may be due to the increased ultra-violet radiation at higher altitudes.

1345. ITÔ, K., and HOSAKA, Y. **Notes on some leaf-spot diseases of broadleaved trees. 1. *Cercospora* leaf spot of Plane trees.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 46, 1950 (17–36). 18 refs. [E.e.jap.]

A fungus isolated from leaves of *P. acerifolia*, *P. orientalis* and *P. occidentalis* was identified as *Cercospora platanifolia*. *P. occidentalis* was the least susceptible of the species attacked. Results of laboratory culture of the fungus are recorded.

1346. CARRANZA, J. M. Antracnosis del aguaribay—causada por *Myxosporella schini* sp. nov., en la Argentina. **[Anthracnose of *Schinus molle*, caused by *M. schini* sp. nov., in Argentina.]** *Revista de la Facultad de Agronomía, La Plata* 27 (Fasc. 2), 1950 (275–81). [Span.span.e.] A.P.B.

The new disease was characterized by leaf spots and twig and branch spots that later turned to cankers. The isolation of the pathogen and results of inoculation trials are reported.

1347. WEBER, G. F., and ROBERTS, D. A. **Silky threadblight of *Elaeagnus pungens* caused by *Rhizoctonia ramicola* n.sp.** *Phytopathology* 41 (7), 1951 (615–21). 6 refs.

Describes this leaf disease, which has been found only in Gainesville, Florida. The fungus is pathogenic to species of *Elaeagnus*, *Ilex*, *Lagerstroemia*, *Gelsemium*, *Rhododendron* and *Pyracantha*.

444. VIRUS DISEASES

1348. TODD, J. M. **An indigenous source of swollen-shoot disease of Cacao.** *Nature, Lond.* 167 (4258), 1951 (952–3). 1 ref. [W. African Cacao Research Institute, Jafo, Gold Coast.]

It was already known that *Cola chlamydantha* is a natural host of virus diseases of Cacao in the Wiawso district, Western Province, Gold Coast [cf. *For. Abstr.* 12 (No. 2364)]. An intensive survey has now shown that infection is widespread throughout the range of *C. chlamydantha* in the Gold Coast. The occurrence of infected specimens in areas where swollen shoot of Cacao is unknown, strongly suggests that virus infection of this species antedates that of Cacao. Taking into account the close ecological association of *C. chlamydantha* and Cacao which results from farming practice, and the

ease with which virus can be transmitted from one to the other, it is postulated that *C. chlamydantha* is the immediate natural reservoir of Cacao viruses in the Western Province. It is absent from the forests of Ashanti and the Eastern Province of the Gold Coast and from most of S. Nigeria.

45. DAMAGE BY ANIMALS

451. *Mammals*

See also Nos. 929–30, 1167–8.

1349. McCABE, T. T. **Beaver on the northern British Columbian islands.** *Canadian Field-Naturalist, Ottawa* 62 (1), 1948 (72–4). B.A.P.

Observations on the habits of beaver in these islands showed that *Tsuga heterophylla* was preferred to Alder as food. The Alder in this region possesses a very hard bark, scarcely 1 mm. thick.

1350. TURČEK, F. Príspevok k poznaniu potravy králika divokého *Oryctolagus cuniculus* L. v prírode. **[The food habits of the European rabbit, *Oryctolagus cuniculus*.]** *Repr.* from *Československý Les* 30 (4), 1950. pp. 7. [Slovak.] B.A.P.

Presents a list of species eaten by rabbits, with notes on the frequency and extent of attack. A large number of trees are included, the seedlings and young plants (particularly saplings put in cleared spaces) being most often attacked.

1351. BRAND, D. **Red squirrel damage to timber.** *Scot. For.* 5 (3), 1951 (89–90).

1352. ETELÄLAHTI, A. E. Havaintoja hirvien aiheuttamista vahingoista taimikoissa. **[Notes on elk damage to young [coniferous] stands.]** *Metsät. Aikak.* 1950 (9), (289–91). [Fi.]

Account of a strip survey (autumn 1949) on a large estate on the Uusimaa/Turku-Pori county boundary. Little research of this sort has been done and conflicting ideas exist about the seriousness of the damage. Classifying this as (0) slight, not lessening the value of the stand, (1) considerable but not ruinous if early protection can be given, (2) ruinous, crop replacement necessary, the author presents a table showing 17·3% of the stands to be in (0), 54·7 in (1) and 28 in (2).

1353. LUTZ, H. J. **Damage to trees by black bears in Alaska.** *J. For.* 49 (7), 1951 (522–3).

[Cf. *For. Abstr.* 13 (No. 452).] Discusses various theories that have been put forward in explanation of the habit of tearing bark from trees.

452. *Birds*

See also No. 1680.

1354. COLQUHOUN, M. K. **The wood pigeon in Britain.** H.M. Stationery Office, London. 1951. pp. 69. 25 refs. (*Agricultural Research Council Report Series* No. 10.) Price 3*s*.

An abridged report of the Wood Pigeon Investigation of the British Trust for Ornithology. In N.E. Scotland, all the highest densities of wood pigeons were found in woods with Sitka Spruce and Douglas Fir; these densities were higher than any found in the mixed woods of southern England. With present forestry practice, a maximum pigeon cover is produced by 15- to 30-year-old stands of Douglas or Sitka, or a mixture of both. The birds prefer younger to more mature plantations, but trees are not colonized until they are 12 ft. high. Larch and Pine plantations rarely support a high density, because of the open nature of the trees. The varied habitats showing high breeding densities in southern England agree in providing dense and shady cover; Hawthorn scrub up to 20–25 ft. high is particularly favoured. Most of the highest densities were found in plantations of less than 5 acres; pigeons do not breed numerously in extensive planted woodlands and heavily afforested areas. Hence, the new state coniferous forests, which cover considerable areas, are not very suitable for wood pigeons as compared with privately owned estate woodlands, where there tend to be small woods and plantations.

Wood pigeons sometimes damage young conifers by perching on the leading shoot, which results in its being bent at right angles or broken, so that the tree forks and the general shape is spoilt. Sitka Spruce suffers most in this way, the leading shoots of Douglas Fir and Scots Pine being more resilient, but Sitka and Douglas are better adapted to sending up a second shoot, whereas a broken leader on a Scots Pine usually results in a misshapen tree. The damage seems confined to June, when the new season's growth is 6–9 in. long, green and sappy, and this is the season when young wood pigeons are making their first clumsy flights and clinging precariously to any object they encounter. On one occasion the author counted over 100 pigeons perched on Spruce tops in an area of 5–6 acres.

453. *Insects*

See also Nos. 912 *et seq.*, 1652–3, 1785.

1355. MORRIS, R. F. **The importance of insect control in a forest management program.** *Canad. Ent.* 83 (7), 1951 (176–81). 2 refs. (*Contribution, Division of Forest Biology, Science Service, Department of Agriculture, Ottawa* No. 10.) O.R.S.

Discusses the rôle of the entomologist in forest management, the importance of ecological studies during outbreaks, and the need for constant attention to economic aspects.

1356. HANSON, H. S. **Forest entomology.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (83–91).

Work has largely concentrated on a survey of sawfly pests, particularly the large Larch sawfly (*Pristiphora erichsonii*). A description of this insect and its life cycle is given, together with an account of an earlier infestation. Notes on 4 other Larch sawflies and a number of Spruce sawflies are also given, as well as on the barkbeetle *Polygraphus polygraphus*, which attacks Spruce trees particularly when they are already attacked by the sawfly *Pristiphora subarctica*.

Several cases have been reported of damage in forest nurseries by short-snouted weevils, *Barypeithes pellucidus*, and *B. araneiformis*, both to seedlings and to young shoots of Poplar cuttings. Both weevils are normally associated with bracken-covered heathland, flood debris, or other decaying vegetation. Heavy dressing of bracken compost was a

constant feature in each of the infested nurseries, and it may be necessary in such cases to use a surface dressing of a suitable insecticide. The subject is being investigated.

The study of aphid and other insect pests of Sitka Spruce was continued. Although formerly the green Spruce aphis, *Neomyzaphis abietina*, was considered to be the only important insect enemy of Sitka, no fewer than 12 species of insect are now known to cause serious damage to the foliage of the current year. Where several pests occur in the same area, it seems probable that the combined effects of their attack on young crops may completely turn the scale and prevent satisfactory growth, whereas in their absence the trees might continue to make satisfactory recovery from the effects of *Neomyzaphis* attack.

1357. CARROLL, J. **The status of forest insect pests in Ireland.** *Proc. 8th int. Congr. Ent. Stockh. 1948*, 1950 (755–8). [E.] O.H.

Lists some insects attacking forest trees, in 3 groups: a relatively small number of major pests, intermediate pests, and minor pests including a large number of species that cause negligible damage.

1358. VIETINGHOFF-RIESCH, A. VON. Beiträge zur Geschichte der Insektenkalamitäten im mitteldeutschen Raum (Oberlausitz). [**The history of insect attacks in central Germany (Oberlausitz).**] *Forstwiss. Cbl.* 70 (7), 1951 (446–55). 7 refs. [G.]

1359. ELTON, E. T. G. Overzicht der beschikbare gegevens over insectenplagen in onze bossen en andere houtopstanden in het jaar 1950. [**Review of available data on insect pests in Dutch forests and other woody growth in 1950.**] *Ned. Boschb.-Tijdschr.* 23 (9), 1951 (227–38). 4 refs. [Du.du.e.]

Cf. *For. Abstr.* 12 (Nos. 3424–5).

1360. STRICKLAND, E. H., and HOCKING, B. **Insects of the Alberta farmstead.** *Bull. Coll. Agric. Alberta Univ.* No. 55, 1950. pp. 116.

Includes a section on pests of shelterbelts and other trees and shrubs.

1361. KERR, T. W. **Several injurious ornamental and shade tree insects and their control.** *J. econ. Ent.* 44 (2), 1951 (234–40). 8 refs. [Rhode Island State College, Kingston.]

Presents detailed results of comparative field tests with petroleum oil, lime-sulphur, lead arsenate, nicotine sulphate, and several chlorinated hydrocarbon materials, against 8 different insect species.

1362. HADLINGTON, P. **Forest insects and wood-destroying insects of New South Wales. Parts II and III. A. Insects attacking the living tree.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 4 (10/12; Spec. issue), 1950 (17–22; 19).

Describes briefly a number of species of Hemiptera and Thysanoptera, and two insects attacking the root system, *Chrysolopus spectabilis* and *Strongylorrhinus ochraceus*. [Cf. *For. For. Abstr.* 12 (No. 1589).]

1363. THOMPSON, W. R. [Editor], *et al.* **A catalogue of the parasites and predators of insect pests. Section 1. Parasite host catalogue. Part 10. Index of parasites of the Lepidoptera. Part 11. Neuroptera, Odonata, Orthoptera, Psocoptera, Siphonaptera, Thysanoptera.** Commonwealth Bureau of Biological Control, Ottawa, Ont., Canada. Pt. 10, 1950, pp. 107. Pt. 11, 1951, pp. iv + 35.

Cf. *For. Abstr.* 10 (No. 2956).

1364. MACLAGAN, D. S. **Modern insecticides and the balance of nature.** *Nature, Lond.* 168 (4270), 1951 (360–2).

Substance of a paper read at the British Association meeting at Edinburgh. Reviews the present state of knowledge and gives a short account of the new systemic insecticides, e.g. octamethylpyrophosphoramide.

1365. ROMANO, E. Il contenuto in DDT, octacloro ed esaclorocicloesano di olii provenienti da oliveti sottoposti a trattamento antidacico. [**The DDT, Chlordan, and BHC content of oils from Olive trees that have undergone treatment against the Olive fly [*Dacus oleae*].**] *Ann. Sper. agr. (n.s.)* 5 (2), 1951 (289–95). 4 refs. [It.it.e.] C.G.B.

The quantities found in the oils were 123 p.p.m. of chlordan, 92–156 p.p.m. of DDT, and 97–150 p.p.m. of BHC.

1366. SIMKOVER, H. G., and SHENEFELT, R. D. **Effect of benzene hexachloride and chlordane on certain soil organisms.** *J. econ. Ent.* 44 (3), 1951 (426–7). 2 refs.

Damping-off of Pine in soils inoculated with *Rhizoctonia* sp. was inhibited by an application of 1 lb./acre γ BHC, whereas 10 lb. Chlordane/acre had very little effect. The Chlordane did not appear to affect mycorrhizal growth, but the number of mycorrhizal rootlets declined as the dosage of γ BHC was increased. At rates of 2½ or 5 lb./acre, root clubbing was severe. No effect on root-nodule formation was found in *Robinia pseudoacacia* seedlings grown in soils treated with (1) 10 lb. Chlordane/acre, and (2) 1 lb. γ BHC/acre.

1367. BENTON, A. H. **Effects on wildlife of DDT used for control of Dutch Elm disease.** *J. Wildlife Mgmt.* 15 (1), 1951 (20–7). B.A.P.

The results of a study of bird and other wildlife mortality, made in 1949 at Princeton, N.J., after spring spraying from 22 March to 18 May with a 2% DDT water emulsion. Of 11 dead birds from a study area of *ca.* 20 acres, only 1 was an adult; the birds found dead were all encountered after 20 April. Had spraying been completed by 15 April, therefore, few birds probably would have been killed. Effects on squirrels are less easily controlled in early spring, since their food supply at that season consists largely of Elm seeds and buds. No appreciable loss of squirrels has yet been reported, however. The number of breeding birds showed a 19·6% decrease in both the study and control areas during the week immediately following spraying. About 2 weeks after spraying, the population in the treated areas began to increase, and within another week was back to pre-spraying level. When only those species common to both areas were considered, a decline of 22% was measured in the population of the sprayed area while the control showed a 6% increase. It is advisable to time the

summer spray to coincide with the slacking-off of nesting, and if reasonable control can be obtained without it, the summer spray would be better omitted. All sources of drinking water should be covered before operations, and contaminated puddles removed as soon as possible afterwards. Dosage should be the minimum required for adequate control.

1368. SALKELD, E. H. **A toxicological and histophysiological study of certain new insecticides as 'stomach poisons' to the honey bee *Apis mellifera* L.** *Canad. Ent.* 83 (2–3), 1951 (39–52; 53–61). 35 refs. O.R.S.

1369. KERR, T. W. JR. **The chemotherapeutic value of several insecticides for larvae of certain leaf mining insects.** *J. econ. Ent.* 44 (4), 1951 (493–8). 9 refs. (*Contribution Rhode Island Agricultural Experiment Station, Kingston* No. 771.)

The relative chemotherapeutic value (i.e., in this case, the ability of the insecticide, when applied to leaf surfaces, to reach and kill larvae which live entirely surrounded by plant tissues) of nicotine sulphate and several chlorinated hydrocarbon insecticidal sprays was tested on the larvae of *Monarthropalpus buxi*, *Phytomyza ilicis* and *Fenusa pusilla*. On *M. buxi* Dieldrin was the most effective, then Aldrin. Nicotine sulphate, DDT, BHC and Lindane also acted as chemotherapeutics, but were less effective. Dieldrin and Aldrin were equally effective on first-instar larvae of *P. ilicis*. Chlordane and Lindane were less effective than Aldrin or Dieldrin [cf. *For. Abstr.* 12 (No. 754)]. On first- and second-instar larvae of *F. pusilla* the descending order of effectiveness was: Dieldrin, Aldrin, nicotine sulphate, Chlordane. DDT had a slight chemotherapeutic effect but this was considerably less than for any other material investigated. *From author's summary.*

1370. LYONS, L. A. **Insects affecting seed production in Red Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (3), 1951 (1).

In this investigation it was found that insect damage was confined almost entirely to cones in the second (final) year of development, but first-year cones were occasionally killed directly by lepidopterous borers, or indirectly by the death of the supporting shoot. The scolytid *Conophthorus resinosae*, which kills cones by constructing a tunnel along the axis, entering at the base, was the most important cause of seed loss. This beetle inflicted further injury to trees in September and October by boring into small twigs and overwintering in the terminal buds. Another cause of serious damage was a group of lepidopterous borers including *Dioryctria auranticella*, *D. reniculella*, *Pinipestis* sp., and *Pyrausta fumoferalis*, which kill some cones outright, and reduce seed production in others. The larvae of *Laspeyresia toreuta* destroyed seed inside the fully grown cone, but left no external evidence of its presence. Cecidomyid larvae damaged seed in a few cones, but were of minor importance.

1371. CHATTERJEE, N. C., BHASIN, G. D., and BHATIA, B. M. **Insect borers of *Boswellia serrata* and their control.** *Indian For. Rec.* (*n.s.*) *Entomology* 8 (5), 1950 (35–51). Price *As.*14 (1*s.* 3*d.*).

Contains information on the life history of the various species attacking *B. serrata* [cf. *For. Abstr.* 13 (No. 755)], the nature and extent of the damage done and simple methods of control. The information given is based partly on field observations recorded between 1941 and 1948. The most damaging species is *Atractocerus reversus* Walk. *From authors' summary.*

Thysanoptera

See also No. 1362.

1372. NOLTE, H. W. Die Bedeutung der Witterungsfaktoren, der Nahrungsqualität und der Feinde für Entwicklung und Vermehrung des Lärchenblasenfusses (*Taeniothrips laricivorus* Krat.). **[The importance of weather, food quality and natural enemies in the development and increase of *T. laricivorus*.]** *NachrBl. dtsch. PflSchDienst.* 5 (3), 1951 (52–4). 5 refs. [G.g.]

The most important factor in conditioning outbreaks of *T. laricivorus* is temperature. High temperatures speed up the life cycle and increase the number of generations in a year. Rainfall is only important in so far as it affects food supply. The influence of natural enemies is small. Outbreaks may usually be expected in a warm summer with normal rainfall.

Hemiptera

See also Nos. 916–7, 1356, 1362.

1373. BROWN, L. R., and EADS, C. O. **Experimental control of Sycamore scale with combinations of oil and certain synthetic organic insecticides.** *J. econ. Ent.* 44 (4), 1951 (611–3). 4 refs.

Sprays of parathion wettable powders (2 lb./100 gal. water) alone, or with 1·5% light-medium oil gave good control of *Stomacoccus platani* when applied in February. For street, roadside and garden trees a relatively safe and effective treatment would be to spray dormant trees with a wettable powder of Toxaphene, DDT or BHC, each used at a rate of 1 lb. of active ingredient per 100 gal. water, and each in combination with 1·5 gal. of a light-medium oil. [Cf. *For. Abstr.* 4 (60).]

Lepidoptera

See also Nos. 918–9, 1370, 1785.

1374. REEKS, W. A. **The Birch casebearer, *Coleophora salmani* Heinr.** *Bi-m. Progr. Rep. For. Biol. Dep. Agric. Can.* 7 (4), 1951 (1).

A short account of recent infestations and a list of parasites that have usually brought outbreaks to an end.

1375. MORRIS, R. F., and BISHOP, R. L. **A method of rapid forest survey for mapping vulnerability to Spruce budworm damage.** *For. Chron.* 27 (2), 1951 (171–8). 12 refs.

Describes a cheap and rapid method for areas where recent cruise data are lacking but air photographs are available. The factors involved are density, relative maturity, and species composition, the first two of which are indicated on the air

photographs by crown closure and tree height respectively. The proportion of Balsam Fir has to be determined by rapid ground surveys. Four broad vulnerability classes are based on the coded values of these factors. When photographs and base maps are available without charge, the cost of such surveys is about $\frac{7}{10}$ cent/acre. [Cf. *For. Abstr.* 11 (No. 705).]

1376. ANGUS, T. A. **Bacteria associated with forest tent caterpillar.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (4), 1951 (2).

Four species of bacteria, as yet unidentified, were isolated from dead or moribund larvae of *Malacosoma disstria*. Two of these are Gram-positive sporulating rods which appear to be related to the *Bacillus cereus* group. The other two, which are much alike and may be identifical, are short, motile, Gram-negative rods. One of the latter, tentatively called Bacterium 'B', is the most promising isolate; it is pathogenic when introduced, even in small quantities, into the body cavity. A large number of larvae were reared under conditions of stress and fed on foliage sprayed with a suspension of Bacterium 'B'. An estimated 70% of these larvae died before pupating, and over 90% of the dead larvae yielded pure cultures of the test organism.

1377 BERGOLD, G H. **Notes on polyhedral disease of forest tent caterpillar, *Malacosoma disstria*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (4), 1951 (1–2).

Gives data on experimental infection of larvae by feeding them on Poplar foliage sprayed with virus suspension.

1378. FOSTER, H. R. **Pre-hatch spray test against the forest tent caterpillar.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (3), 1951 (1–2).

A pre-hatch aerial spray of DDT (12½% DDT in fuel oil at *ca.* 6 qt./acre) was applied on 27 April to a stand of small Aspens bearing egg bands. The % of emerged larvae surviving on 9 May was 26 compared with 57·5 and 61·5 on control plots.

1379. ANDROIĆ, M. Topolin gubar (*Stilpnotia salicis* L.). **[The satin moth (*Leucoma salicis*).]** *Šum. List* 74 (12), 1950 (484–7). [Croat.]

Observations on the moth's attack on 20 trees of 'Canadian' Poplar in the Theatre Park at Rijeka (Fiume), and subsequent breeding in the [Zagreb?] Institute of Entomology. In mid-July, 1950, the larvae in the park were in the 3rd and 4th instars. First pupae were observed on 18 July, first imagos on 29 July, and first new-hatched larvae on 4 August. These larvae were then transferred to the laboratory. They moulted four times, the last time immediately before the pupal stage; they pupated on 18 Sept., and the new moths appeared on 3 October. Two days later the females laid eggs. It seems that the number of generations per year depends entirely on such external conditions as temperature, air humidity, and rainfall.

1380. GÄBLER, H. Kritische Ei- und Puppenzahlen von Nonne, Kiefernspanner und Kieferneule an Kiefer. **[Critical egg and pupae counts for nun moth, Pine looper-moth and Pine noctuid on Pine.]** *Anz. Schädlingsk.* 24 (9), 1951 (140–3). 11 refs. [G.]

Presents tables showing critical egg and pupae counts for *Lymantria monacha*, *Bupalus piniarius* and *Panolis flammea*. The counts are related to stem diameter at the point where the crown begins and to needle weight. [Cf. *For. Abstr.* 11 (No. 2282).]

1381. GÄBLER, H. Über den richtigen Zeitpunkt einer Nonnenbestäubung. **[The right time for dusting to control the nun moth.]** *NachrBl. dtsch. PflSchDienst.* 5 (3), 1951 (54–8). [G.]

The author advises early treatment of outbreaks, in order to prevent as much damage as possible and avoid killing off tachinid parasites.

1382. ANDROIĆ, M. Otpornost gubarevih gusjenica (stadij I–V) prema parathionu i pantakanu. **[The resistance of *Lymantria dispar* larvae (stages I–V) to Parathion and DDT.]** *Šum. List* 75 (5), 1951 (181–93). 11 refs. [Croat.croat.f.]

Deals with laboratory tests, the results of which are given in graphs. 'Pantakan', a DDT preparation made in Jugoslavia, was used either in emulsion (1% DDT) or as a dust (5% DDT). Parathion was used in liquid concentrations of 0·025% and 0·05%. Parathion, in the concentrations used, gave a complete kill of all but the 5th-stage larvae, though the time taken varied with larval stage, being most rapid in stages 1–2 and stage 4. The Pantakan preparations also killed all larvae except in the 5th stage; in stages 1–2 they were less effective, but in stage 3, more so, than Parathion. The dust gave better results than the emulsion.

In practice, early treatment is clearly desirable. Either Pantakan or Parathion should give control up to the 4th stage, but in that stage Parathion is less desirable since the larvae feed on the treated foliage and thus do some damage before they die. At the 5th stage the amounts and concentrations required for control would be uneconomic.

Coleoptera

See also Nos. 920–3, 971, 1140, 1335, 1356, 1370, 1400, 1660, 1785.

1383. JACQUIOT, C. Des relations entre les attaques d'*Agrilus biguttatus* Fab. et certains cas de dépérissement des chênes. **[The relationship between attacks by *A. biguttatus* and some cases of die-back in Oaks.]** *Repr.* from *Revue de Pathologie végétale et d'Entomologie agricole de France, Paris* 39 (4), 1950 (171–82). 8 refs. [F.] X.

Irregularities in the wood structure of Oaks (*Q. robur* and *Q. pubescens*) attacked by *A. biguttatus* have been examined [cf. *For. Abstr.* 13 (No. 486)]. Sapwood vessels in the annual rings for a year or two before the attack were blocked by tyloses. Only the outermost rings were affected and the reaction extended only 4–5 cm. beyond the galleries. Normally the hindrance to the passage of liquids is too slight to damage the tree, but if galleries are numerous, if the attack is repeated in several successive years, and if there are several dry summers (as in 1945, 1947 and 1949), die-back may occur.

1384. BUSCA ISUSI, J. M. Una plaga de las mimbreras de Guipuzcoa, *Cryptorrhyncus lapathi* L. **[A pest attacking osiers in Guipuzcoa [Basque Provinces], *C. lapathi*.]** *Munibe, San Sebastián* 2 (3), 1950 (143–7). 6 refs. [Span.]

Notes on the life history of the borer, which attacks chiefly *Salix americana*. The insect is resistant to DDT, and, since it does not feed on the exterior parts of the plants, is unaffected by As preparations. Hand collecting is a useful but laborious method of control. As a preventive measure the remains of osiers left after harvesting should be burnt, and dead leaves also burnt or buried. [Cf. *For. Abstr.* 9 (No. 2590).]

1385. WILLIAMS, J. R., MOUTIA, L. A., and HERMELIN, P. R. **The biological control of *Gonipterus scutellatus* Gyll. (Col. Curculionidae) in Mauritius.** *Bull. ent. Res.* 42 (1), 1951 (23–8). 10 refs.

Gonipterus scutellatus is believed to have entered Mauritius during 1935–40, and by 1944 *Eucalyptus* plantations over the whole island were threatened. Liberations of *Anaphoidea nitens* were made in 1946, and within 2 years effective control of *G. scutellatus* was achieved. Short notes are presented on *G. scutellatus* and on *A. nitens* and its distribution in Mauritius. [Cf. *For. Abstr.* 11 (No. 731); 12 (No. 772).]

1386. WARREN, G. L., and WHITNEY, R. D. **Spruce root borer (*Hypomolyx* sp.), root wounds, and root diseases of White Spruce.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (4), 1951 (2–3).

The larvae of *Hypomolyx* bore into the underbark and along the cambium of the roots. Small roots, less than 1·5 in. in diameter, are often completely girdled and killed. A preliminary survey of Riding Mountain National Park, Manitoba, indicates that certain areas, particularly where Spruce is invading grassland, are free from *Hypomolyx* attack. In infested areas, the average age and size of trees undergoing initial attack are 21 years and 2·3 in. diameter at a 1-ft. stump.

Analysis of the roots of 130 small trees 15–35 years old, showed that 15 trees or 11·5% were infected with decay organisms (10 with *Armillaria mellea*, 2 with *Polyporus circinatus* and 3 with *P. circinatus* var. *dualis*). In the root systems analysed, the most conspicuous wounds commonly encountered were those caused by *Hypomolyx*. Other common kinds of wound are caused by hoofs of large animals to surface roots, and by pressure of expanding roots against stones or other roots. Any wound or lesion in which the cambium has been killed or interrupted is a potential point of infection.

1387. BAYNE, A., and CHRYSTAL, R. N. **The clay weevil (*Otiorrhynchus picipes* F.), an occasional pest of young coniferous plantations.** *Quart. J. For.* 45 (3), 1951 (169–71). 5 refs.

Damage to young Japanese Larch, at first attributed to *Hylobius abietis* [cf. *For. Abstr.* 11 (No. 713)], was later shown to be due to *O. picipes*. A short account of the outbreak with some notes on the weevil are given.

1388. SHENEFELT, R. D. **A further note on the control of the White Pine weevil.** *J. For.* 49 (8), 1951 (575–6). 2 refs.

Fresh experiments confirmed previous findings on the efficacy of spraying with Pb arsenate to control *Pissodes strobi*. [Cf. *For. Abstr.* 12 (No. 2395); 13 (No. 490).]

1389. PFEFFER, A. **Les invasions des bostryches dans les forêts de la Tchécoslovaquie. [Barkbeetle attacks in the forests of Czechoslovakia.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (799–801). 5 refs. [F.] O.H.

1390. FRANCKE-GROSMANN, H. **Die Gefährdung der Sitkafichte durch Rotfäule (*Fomes annosus* Fr.) und Riesenbastkäfer (*Dendroctonus micans* Kug.) in Aufforstungsrevieren Schleswigs. [Danger to Sitka Spruce from *F. annosus* and *D. micans* in afforestation areas of Schleswig.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (773–80). 8 refs. [G.] O.H.

Discusses the status of *D. micans* as a primary and secondary (succeeding *F. annosus*) pest of Sitka Spruce and describes the progress of the attack.

1391. ELTON, E. T. G. ***Dendroctonus micans* Kugel., a pest of Sitka Spruce in the Netherlands.** *Repr.* from *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (759–64). 17 refs. [E.]

Since its appearance in the Netherlands in 1935, *D. micans* has generally been found as a primary pest on Sitka Spruce. Natural enemies have so far rarely been found attacking it, and are unlikely ever to give complete control. The rotation period of the tree will probably be limited to about 40 years by *D. micans* attack.

1392. DAVIDSON, R. W. **A deterioration problem in beetle-killed Spruce in Colorado.** *Abstr.* in *Phytopathology* 41 (6), 1951 (560).

Examination of *Picea engelmanni* in the White River National Forest, Colorado, which had been killed by *Dendroctonus engelmanni* several years before [cf. *For. Abstr.* 11 (No. 714)], showed that decay was present in the base of the trunks up to a height of 2–3 ft. Moisture content of the decay streaks was 60–100%, compared with 12–20% for sound wood of the same stumps. In an area where the trees had been dead only a few years, there was no advanced decay, but vertical wet streaks were present in the base of the trunks.

1393. MATHERS, W. G. **Douglas-fir beetle.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (3), 1951 (3).

A study was made of an outbreak of *Dendroctonus pseudotsugae* in British Columbia. In comparing beetle-killed with uninfested trees, omitting trees that had been injured, no obvious reason was found for one tree and not others in its vicinity to be attacked, and there was no correlation between attack and crown class, size or shape of crown, or d.b.h. Tree vigour, however, as indicated by the number of growth rings in the outer ½-inch of increment borings, did show a correlation. It was evident that, in an even-aged mature or over-mature stand those trees with a slower growth rate than the average for the stand are the most liable to bark-beetle attack. Injured trees, regardless of their growth rate, are more attractive to bark beetles than uninjured.

1394. ADAMS, A. J. S. **Control of the Pine bark beetle (*Hylastes ater*) at Mt. Burr, South Australia:** *Aust. For.* 14 (2), 1951 (111–2). 6 refs.

This endemic beetle caused damage to the second-rotation crop of *Pinus radiata* at Mt. Burr [cf. *For.*

Abstr. 5 (p. 284)]. Satisfactory control has been obtained by completely felling the planting area before mid-summer, burning all slash *in situ* in autumn, and planting in the winter.

1395. ULRICH, A. Übersicht der hessischen Fichtenborkenkäfer-Schäden 1945–1950. **[Review of Spruce barkbeetle damage in Hessen 1945–50.]** *Forst u. Holz* 6 (16), 1951 (234–5). [G.]

1396. LEBEDEVA, L. I. Opyt primenenija dustov DDT i GHCG protiv li inok maïskogo hrušča. **[Trial of DDT and BHC dusts against cockchafer larvae.]** *Lesn. Hoz.* 1950 (5), (65–8). [Russ.]

In laboratory tests of 7% BHC and 5% DDT against all larval stages of the insect, BHC proved highly effective, but results with DDT were unclear. In field experiments with 7% BHC on a Scots Pine plantation area, the dust was applied in 3 ways: (1) dusted over the whole plot at rates of 120, 80 and 40 kg./ha., followed by digging over to a depth of 18–20 cm.; (2) 4 or 2 g. dusted into each planting hole; and (3) 1–1½ g. dusted over the root system of each plant before planting. Method (1) gave an 86–7% kill at 120 and 80 kg./ha., but only 62% at 40 kg./ha. (2) and (3) gave complete protection from larvae for at least 1 year, but (3) caused retarded growth and in some cases, death of the plants, and is therefore to be avoided. Further research is desirable. [Cf. *For. Abstr.* 13 (No. 1140).]

Hymenoptera

See also Nos. 1356, 1369.

1397. FISHER, R. C. **A note on *Sirex* woodwasps.** *Timber News* 59 (2146), 1951 (332–3).

Brief information on *Sirex gigas* and *S. cyaneus*.

1398. **Sirex Advisory Committee Regulations 1950.** Government Printer, Wellington, New Zealand, 1950. pp. 3.

Defines the composition and functions of a Committee set up to advise the Minister on possible control measures to prevent damage to Pine forests by *Sirex noctilio*.

1399. RAWLINGS, G. B. **The establishment of *Ibalia leucospoides* in New Zealand.** *For. Res. Notes N.Z. For. Serv.* 1 (3), 1950 (1–14). 4 refs.

A brief account is given of *Sirex noctilio* [cf. *For. Abstr.* 12 (No. 1609)], and its parasite *Ibalia leucospoides*. Possible methods which may be adopted to establish the parasite in New Zealand are discussed. Observations on *Sirex* which have a direct bearing on the successful establishment of *Ibalia* are given. These include rearing techniques, the carrying over of the symbiotic fungus, parthenogenesis, sex determination in larvae, and notes on oviposition. The *Ibalia* received from England in 1950 are enumerated and the results so far achieved are noted. The programme for 1951 is set out.

1400. GOURLAY, E. S. **Notes on insects associated with *Pinus radiata* in New Zealand.** *Bull. ent. Res.* 42 (1), 1951 (21–2). 2 refs. [Cawthron Institute, Nelson.]

Parasitization of *Sirex noctilio* by the native oryssid wasp *Guiglia schauinslandi* has been noted, but the % is probably low. The indigenous beetles *Stenopotes pallidus* and *Anthribus sharpi* also were found on *Pinus radiata*.

1401. WEBB, F. E., and FORBES, R. S. **Notes on the biology of *Pleuroneura borealis* Felt (Xyelidae: Hymenoptera).** *Canad. Ent.* 83 (7), 1951 (181–3). (*Contribution, Division of Forest Biology, Science Service, Department of Agriculture, Ottawa*, No. 7). O.R.S.

Injury to *Abies balsamea* shoots in New Brunswick was found to be due to *P. borealis*. The results of field and laboratory observations are presented. New shoots of the 2-, 3-, and 4-year-old whorls on trees about 6 ft. high are preferred; leaders are rarely damaged. Although some new foliage is destroyed the trees are not seriously injured.

1402. CEBALLOS, G. Una experiencia de entomologia aplicada. **[An experiment in applied entomology.]** *Revista de Ciencia aplicada, Madrid* 3 (Fasc. 5, No. 10), 1949 (346–8). [Span.] L.S.

An unusually severe infestation of *Diprion pini* occurring along with *Lymantria monacha* in Pine stands in Tervel, led to the initiation of experiments to find parasites suitable for biological control operations. A large number of new and known parasites were isolated from the larvae, the most important being *Exenterus* sp., *Microplectron* sp. and *Sturmia inconspicua*, Results up to the time of writing were promising.

1403. MORRIS, R. F. **The larval Elateridae of eastern Spruce forests and their rôle in the natural control of *Gilpinia hercyniae* (Htg.) (Hymenoptera: Diprionidae).** *Repr.* from *Canad. Ent.* 83 (6), 1951 (133–47). 7 refs. (*Contribution, Division of Forest Biology, Science Service, Department of Agriculture, Ottawa* No. 9.)

Extensive collections were made of elaterid larvae occurring on the forest floor of coniferous stands, in order to study their importance in the natural control of *G. hercyniae*. Some 20 species, collected from litter under Spruce, are listed, and a key is presented for their identification. The results are reported of observations on the populations, their habits and the degree of control exercised by them. It is concluded that, in comparison with small mammal predators, larval Elateridae play only a minor part in the control of *G. hercyniae* during the cocoon stage.

1404. REEKS, W. A., and BARTER, G. W. **Growth reduction and mortality of Spruce caused by the European Spruce sawfly, *Gilpinia hercyniae* (Htg.) (Hymenoptera: Diprionidae).** *For. Chron.* 27 (2), 1951 (140–56). 18 refs.

The characteristics and effects of defoliation of Spruce (*Picea glauca* and *P. mariana*) by the sawfly are described and compared with those of defoliation by the Spruce budworm, and an account given of the outbreaks in the Gaspe, other parts of Quebec, and New Brunswick. Defoliation caused a gradual reduction in the width of the annual ring throughout the stem. This was greatest in the lowest part. The effect of defoliation in one year was shown in the ring of the following year. Reduction of growth was proportionate to the rate of growth before attack. Surviving trees had as many as 4

rings completely missing in the lower stem, and several partial rings. No rings were missing in the upper stem. Loss of 20–50% of the old foliage was necessary to cause measurable reduction in the ring. Loss of all the old and 75% or more of the new foliage was generally necessary to cause death. Trees continued to die up to 7 years after defoliation ceased. *From authors' summary.*

1405. BRADLEY, G. A. **Notes on the parasitism of the yellow-headed Spruce sawfly *Pikonema alaskensis* (Roh.) (Hymenoptera: Tenthredinidae).** *Canad. Ent.* 83 (5), 1951 (130–1). (*Contribution, Division of Forest Biology, Science Service, Department of Agriculture, Ottawa* No. 6.) O.R.S.

Eleven hymenopterous and one dipterous species were isolated at Dahlton, Sask., and are listed with their times of emergence and relative abundance. [Cf. *For. Abstr.* 13 (No. 505).]

1406. LEJEUNE, R. R. **Some ecological factors governing populations of the Larch sawfly, *Pristiphora erichsonii*.** *Repr.* from *Canad. Ent.* 83 (6), 1951 (152–6). 8 refs. (*Contribution, Division of Forest Biology, Science Service, Department of Agriculture, Ottawa* No. 5.)

Results of observations made in Manitoba and Saskatchewan on the influence on sawfly populations of soil moisture, parasites, and predators, and of the modifications of tree growth brought about by the attack.

Diptera

See Nos. 925–6, 1369–70.

459. *Other Animals*

1407. FLETCHER, F. W. **Ovotran wettable a new miticide for shade trees.** *Trees, Cleveland, Ohio* 11 (4), 1951 (8). 15 refs. [Dow Chemical Co., Midland, Mich.]

A short account of an effective new agent for killing mites on woody species, K-6451 (*p*-chlorophenyl *p*-chlorobenzene sulphonate), soon to be marketed under the trade name Ovotran Wettable.

1408. **[Control of the giant African snail *Achatina fulica*).]** [*Biennial*] *Rep. Bd. Agric. For. Hawaii 1946–48* [? 1949] (69–70).

A programme has been adopted for keeping the snail within the present boundaries of infestation and reducing its numbers by a new poisoning technique. This consists in making a poisonous whitewash containing by weight 40% $Ca_3(AsO_4)_2$, 55% slaked lime, and 5% cement. This is painted on to rocks, stumps etc. in infested areas or, failing them, pebbles are dipped in the wash and then scattered over the field. The snail, in seeking calcium to build its shell, ingests the poisonous whitewash and dies. The boundaries of infested areas are sprayed periodically to kill vegetation and snails that may be moving out. [Cf. *For. Abstr.* 13 No. 508).]

46. DAMAGE TO TREE GROWTH BY MAN

1409. **[The effect of logging on advance reproduction in the forests of Benin.]** *Rep. For. Adm. Nigeria 1949/50*, 1951 (20–1).

Surveys of typical logging areas in forests managed under a tropical shelterwood system, showed that, with reasonable care, damage to advance reproduction was much less than had been feared. [Cf. *For. Abstr.* 12 (No. 2867).]

1410. ČOKL, M. **Steljarenje kot gozdarsko-kmetijski problem. [Removal of litter as a problem of forestry and agriculture.]** *Gozd. Vestn.* 9 (4), 1951 (81–93). 8 refs. [Slovene.croat.f.]

The removal of litter for farming has been practised in Slovenia for several centuries. A decree of 1771 introduced a fine of 1 gulden for the mowing of litter and for raking it with iron rakes. Some 150,000–200,000 ha. (or *ca.* ⅓ of the total area of) farmers' forests in Slovenia is subjected to annual raking off of litter; these forests have now no other value than as a source of litter, because of the ever-degenerating growth of the trees. It is estimated that, owing to excessive cutting and to the removal of litter, the wood yield of Slovene forests is less than ½ of the potential yield; moreover, the quality of wood (especially Beech and Pine) is low, and the retention of water is considerably reduced. The great damage done to the national economy is out of all proportion to the doubtful advantage gained by agriculture. Several ways of reducing the consumption of litter are suggested: (1) better cow-sheds, requiring less litter; (2) more economical use of dung, mostly as manure for meadows and pastures, combined with the ensilage of green fodder, while straw, now consumed as fodder, should be used for bedding; (3) the use of peat, sawdust, and sand for bedding.

48. INJURIES DUE TO UNKNOWN OR COMPLEX CAUSES

See also No. 1326.

1411. **The littleleaf disease of Pine.** [*Biennial*] *Rep. Stheast. For. Exp. Sta. 1949/50* [1951] (11–4).

Phytophthora cinnamomi, abundant in littleleaf stands, has been found to occur throughout the south-east in old fields, in young and old Pine stands and in hardwood stands, and its presence is probably not often a limiting factor in littleleaf. When the fungus was added to the soil round potted Pines the crown failed to develop full vigour and the roots were badly rotted.

Figures are given showing the % of dead roots in Loblolly and Shortleaf Pines; young healthy Pines showed only 3% dead roots, older healthy Loblolly 6, older healthy Shortleaf 18 and older little leaf Shortleaf 34%. The lower % of dead roots in Loblolly indicates the reason why it appears to be less susceptible to littleleaf disease than Shortleaf Pine.

On 180 plots in littleleaf and healthy stands, a low % of littleleaf was found on soils with good and a high % on soils with poor internal drainage. *Phytophthora cinnamomi* counts did not show any relationship between the amount of the fungus present and the amount of the disease. No relation has so far been found between littleleaf abundance and soil pH.

Trees on plots treated with large amount of N fertilizers continue to improve. Subsequent occurrence of littleleaf has decreased slightly in areas where littleleaf trees have been removed annually.

Where littleleaf scions have been grafted on healthy stock, the scions have grown out of the littleleaf condition and look very healthy, indicating that the disease has not been transmitted by grafting. [Cf. *For. Abstr.* 11 (No. 661).]

1412. CAMPBELL, W. A. **The occurrence of *Phytophthora cinnamomi* in the soil under Pine stands in the Southeast.** *Phytopathology* 41 (8), 1951 (742–6). 11 refs.

A study was made of the relative abundance of *P. cinnamomi* in soils around littleleaf and healthy Pines over a large area in the Southeast. Although the fungus was found in 91% of plots occurring in the littleleaf area of S. Carolina, it also occurred in practically all the areas tested, and is found in places far from any known source of a recognized disease. [Cf. *For. Abstr.* 13 (No. 512).]

1413. **[Sudden-death of Cloves.]** *Rep. E. Afr. Agric. For. Res. Organ. 1950*, 1951 (13–4, 38–9).

Transmission experiments, both mechanical and by insects, have not yet proved the hypothesis that the disease is caused by a virus, but it still has strong circumstantial validity and research continues on the bionomics of those insects that might be concerned in virus transmission. The association between the ant *Oecophylla longinoda* and the scale insect *Saissetia* has been investigated, and a study is being made of the degree of protection against predators and parasites enjoyed by the scale insect through its association with the ant. In this work, an important and unexpected relation was found between the Clove and Coconut crops of Zanzibar. Damage to ♀ flowers of Coconut by a coreid bug is less in areas that adjoin the Clove-tree nests of *O. longinoda* than elsewhere, probably because the ant is a predator of the bug. There is therefore a possibility that a mass destruction of the ants' nests, should the scale prove to be a vector of the virus, might involve some additional action to protect the Coconut crop.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also No. 885.

1414. PRODAN, M. Messung der Waldbestände. **[The measurement of forest stands.]** J. D. Sauerländer's Verlag, Frankfurt/M. 1951. pp. vi + 260. 100 refs. [G.]

A textbook which aims at incorporating the chief developments in forest mensuration in Germany and elsewhere, especially the use of statistical methods, since the publication in 1927 of Tischendorf's *Lehrbuch der Holzmassenermittlung*. The main groups of chapters deal with the measurement of:—felled timber (pp. 4–48); individual standing trees (pp. 49–58); stands, with sections on theory (with special reference to the statistical problems involved and to the relative positions in the population of the various kinds of mean tree) (pp. 59–126) and practice (pp. 127–77); and age and increment of trees and stands. There are a subject index and an index to names of authors quoted.

52. MEASUREMENTS OF STEM DIMENSIONS AND VOLUME OF TREES, STANDS, FORESTS AND TIMBER

521. *Diameter (Girth) and Sectional Area*

1415. ALLISON, B. J., and MORRISON, A. **Two ready reckoners for use in volume calculations.** *Scot. For.* 5 (2), 1951 (57–66).

The first table gives under every quarter-girth (QG) from 2 in. to 25¾ in. the equivalent sectional area, calculated as

$$\text{Sectional area} = \frac{(QG)^2}{144} \text{ sq. ft.}$$

The second table gives for each QG at breast height, the corresponding sectional area at half merchantable height, taking this as the mean of b.h. sectional area and that of top merchantable height (3 in. diam.), from which multiples from 1 to 9 allow volumes to be computed according to length of the merchantable bole.

522. *Height, Length*

See also No. 1443.

1416. BRENNEMAN, D. L. **Measuring tree heights in dense young stands.** *J. For.* 49 (6), 1951 (445–7).

Describes the method of constructing a telescopic bamboo rod painted in alternate 1-ft. bands of red and white, for measuring heights up to 35 ft. The rod was very light and durable and easy to use.

1417. HENRIKSEN, H. A. Højde-diameter diagram med logaritmisk diameter: kort meddelelse om en sikreree måde til højdebestemmelse efter højde-diameter diagram, der er indført ved Statens forstlige Forsøgsvæsen. **[Height/diameter curve with logarithmic diameter: brief report on a more reliable method of height determination from height curves, introduced by the State Forest Research Branch.]** *Dansk Skovforen. Tidsskr.* 35 (4), 1950 (193–202). [Dan.]

The relation between height and the logarithm of diameter is shown to be approximately linear; it can be represented by the general equation

$$h = \alpha \log d + c,$$

where α is a slope coefficient, viz. the difference of two points on the ordinate axis, representing the weighted means of groups having the largest and smallest diameters, divided by their difference on the abscissa [i.e. by the difference of their logarithmic diameters], and c is a constant. This relationship has been tested for Norway Spruce and Beech, and for both species α appears to increase with increasing stand height, but c is believed to remain more or less constant during stand development.

This linear relationship can be conveniently used to estimate the heights of stands for given stand diameters: (1) by connecting two weighted mean points; or (2) by drawing a straight line through a single weighted mean, and using for c either a graphical estimation (from inspection of the plotted h/d measurements), or a previously calculated empirical value. Data and graphs for Danish sample plots in Norway Spruce and Beech are given in illustration, and examples are tabulated which suggest that no great accuracy is necessary in determining c. The variation of empirical values for c is being studied by the State Forest Research Branch.

1418. EMROVIĆ, B. Grafička primjena Levakovićevih formula. **[The graphical application of Levaković's formulae.]** *Šum. List* 75 (3/4), 1951 (148–56). 11 refs. [Croat.g.]

An attempt at expressing graphically Levaković's formulae for stand height [*Glasn. sumske Pokuse* 4, 1935 (283–301)] viz:—

$$y = a\left(\frac{x^c}{b + x^c}\right)^d$$

and the simplified formula

$$y = a\left(\frac{x}{1 + x}\right)^d$$

where y = height above b.h. (i.e. height *minus* 1·3 m.), x = d.b.h., and a, b, c, and d are constants. In logarithmic form, both equations become quasi-linear. By using the method of anamorphosis, each height curve can be transformed into a straight line when suitable scales are used. The full 4-parameter equation gives better results than the simplified one, but both equations can be used only for a given area, as the constants b and c depend upon soil class and type of stand. The parameter a can easily be read off the graph.

523. *Bark*

1419. ANTONIOTTI, G. B. Il volume della corteccia del cerro cresciuto in fustaia coetanea. **[The volume of bark of *Quercus cerris* grown in even-aged stands.]** *Ital. for. mont.* 6 (3), 1951 (150–1). [It.]

524. *Determination of the Volume of Trees and Stands*

524.3 Volume of Tree Groups and Stands

See also Nos. 1415, 1428, 1451.

1420. HUMMEL, F. C., IRVINE, T. W., and JEFFERS, J. **General volume tables for Corsican Pine in Great Britain.** *For. Rec. For. Comm., Lond.* No. 11, 1951. pp. 25. Price 1*s.* 6*d.*

1421. RAWAT, A. S. **Sampling techniques for estimating tree growth and volume by selection of sample trees for measurement within individual sample plots.** *Indian For.* 75 (10), 1949 (1951), (379–97).

Recommends stratified random sampling instead of the existing practice based on Schwappach's height and form-factor curve method. A sample should consist of at least 15 trees.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See Nos. 1250, 1759.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 1754, 1758–59.

1422. ŠIMÁK, M. Die Entwicklung und die heute angewandte Arbeitsmethodik bei der zweiten schwedischen Reichswaldtaxierung. **[The development and the present methods of making forest inventories for the second Swedish forest survey.]** *Schweiz. Z. Forstw.* 107 (7), 1951 (362–77). 24 refs. [G.f.]

1423. WYATT-SMITH, J. **Forest enumeration surveys.** *Malay. Forester* 14 (2), 1951 (66–74). 2 refs.

Particulars, including a list of permitted vernacular names and sample forms, of the methods to be used in future for enumeration surveys (other than regeneration) in Malaya. [Cf. *For. Abstr.* 13 (No. 978).]

1424. GRIFFITH, A. L. **East African enumerations: the Rondo plateau (S. Tanganyika).** *Emp. For. Rev.* 30 (2), 1951 (179–82). 7 refs.

Examination of data from enumerations made in 1935–6 and 1938 showed that in undeveloped East African forest, provided that the sampling is carried out with a full appreciation of the probable trends of fertility gradients, a 10% systematic strip enumeration will result in a probable error within ± 10% to ± 15%, which is usually sufficiently accurate for practical purposes in tropical forestry at present. The number of samples taken is of great importance and should not be fewer than 100. The examination also demonstrated the necessity of preserving field-books as permanent records. [Cf. *For. Abstr.* 12 (No. 3488).]

525. *Volume by Assortments. Merchantable Volume*

See also No. 1430.

1425. SPEER, J. Die Rivalität zwischen Langholz und Faserholz bei Fichte. **[Competition between sawlogs and pulpwood in converting Spruce.]** *Forstwiss. Cbl.* 70 (6), 1951 (355–8). 5 refs. [G.]

Discusses and estimates the potential outturn of sawlogs and pulpwood from Spruce of various dimensions, with special reference to German standards and the relative value of each in the German market.

1426. DUFF, G. **Comparison between the volumes of forked and normal trees of *Pinus radiata* D. Don in Kaingaroa State Forest.** *For. Res. Notes N.Z. For. Serv.* 1 (2), 1950 (28–31).

Volumes of 234 forked trees were measured (1) to 4-in. top inside bark, actual volumes above stump; and (2) to 6-in. top inside bark, merchantable volumes above stump (i.e. volume of reasonably straight logs with a minimum length of 10 ft.). It

was found that (1) was generally a little (say 5%) higher than in normal trees, but (2) was only ⅔ that of normal trees.

526. *Log Measurement. Scaling*

1427. FAIRBAIRNS, A. W. **Measurement of round logs.** *Emp. For. Rev.* 30 (2), 1951 (166–71).

A short account of the methods of log-scaling in general use.

1428. DEMENTJEV, N. N. Opredelenie ob'emov breven i stvolov rastuščih derevjev. [**Determination of the volume of logs and standing trees.**] *Lesn. Hoz.* 1950 (5), (62–4). [Russ.]

Presents simple empirical formulae, designed in the first place to assist men being trained in ocular estimation and to serve when suitable tables are not at hand, and compares the results with those given by the U.S.S.R. standard procedure [not specified].

53. SPECIAL MEASUREMENTS OF TREES AND STANDS (CROWN DIMENSIONS, STAND DENSITY ETC)

See also Nos. 1445–6.

1429. MINOR, C. O. **Stem-crown diameter relations in Southern Pine.** *J. For.* 49 (7), 1951 (490–3). 8 refs.

Linear regression equations have been prepared, describing the relations between d.b.h. and crown diameter for *Pinus taeda* and *P. palustris* in S.E. Louisiana. High degrees of positive correlation were found for both species. The effect of stand density, in terms of trees/acre, upon the d.b.h./crown-diameter relation was analysed for *P. taeda*, and was found to be negligible for practical purposes, probably because of stabilization of basal area/acre within the sawlog stands sampled. Some practical applications of these results to the interpretation of air photos are described. [Cf. *For. Abstr.* 13 (No. 1451).] *From author's summary.*

1430. CHINTE, F. O. **Growth and development of young stands of Gubas (*Endospermum peltatum* Merr.).** *Philipp. J. For.* 6 (3), 1951 (245–63 + 5 photos). 12 refs.

A study of the species grown in pure stands, covering the rate of increment of diameter and total height, and the development of clear bole in different diameter and crown classes. An attempt was made to determine the relationships between (1) diameter and total height, (2) diameter and development of clear bole, and (3) width of crown and development of clear bole. Relationship (3) is expressed in the following regression equation (all measurements in metres):—

clear length = 5·86 + 1·38 crown width.

54. ASSESSMENT OF SITE QUALITY

See also Nos. 890, 896–7, 900, 1022, 1436, 1444, 1785.

1431. KABZEMS, A. **Some principles of forest site-type classification.** *For. Chron.* 27 (2), 1951 (157–63).

Describes and discusses V. Eiche's method of site classification in Latvia.

1432. RALSTON, C. W. **Some factors related to the growth of Longleaf Pine in the Atlantic Coastal Plain.** *J. For.* 49 (6), 1951 (408–12). 4 refs.

A number of soil, vegetation and other factors were sampled on 303 areas of even-aged *Pinus palustris* on the Atlantic Coastal Plain. Statistical analyses of the data indicated that age of stand, moisture equivalent of the B horizon, depth of soil to mottling (indicating poor drainage), stand density, resin-tapping, and latitude, were significantly related to height growth. A rapid method for field estimation of site quality of Coastal Plain soils for Longleaf Pine is discussed. *From author's summary.*

1433. GAISER, R. N. **Relation between topography, soil characteristics, and the site index of White Oak in southeastern Ohio.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 121, 1951. pp. 12. 8 refs.

The following results were obtained from a study on 51 ¼-acre circular plots in even-aged stands of White Oak over 30 years old, each enclosing a single soil type and a surface soil of nearly uniform depth: (1) The quality of the land for White Oak growth is highest on the lower slopes and decreases rapidly towards the ridge line. (2) Better sites occur on north-eastern, and poorer on south-western and western exposures. (3) The slope of the land does not appear to influence quality. (4) Site quality increases with the depth and available soil moisture of the A horizon. (5) Subsoil properties have slight influence on site quality. Relationships between site index and the other factors are shown in graphs and tables. [Cf. *For. Abstr.* 13 (No. 900).]

1434. GAISER, R. N., and MERZ, R. W. **Stand density as a factor in estimating White Oak site index.** *J. For.* 49 (8), 1951 (572–4).

The height growth of even-aged White Oak [*Quercus alba*] is significantly modified by stand density. Site-index curves, corrected for variation in stand density, have been developed for White Oak in south-eastern Ohio, and an example of their use is presented. The modified curves differ from conventional site-index curves at both the statistical and practical levels of significance. *Authors' summary.*

55. AGE DETERMINATION

1435. **Tree ages in virgin rain forest estimated.** *Carib. For.* 12 (1), 1951 (10–1, 27–8). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11, [1950?].)

Presents a table showing the estimated ages of different diameter classes in virgin lower-montane rain forest (Tabonuco type) in the Luquillo Mountains, Puerto Rico. The data, based on a 3-yearly record of the diameter growth of 639 trees of 2 in. d.b.h. and over, illustrate the slow growth of trees under the intense competition that develops in tropical virgin stands. A tree of 40 in. d.b.h. was estimated to be *ca.* 460 years old.

56. INCREMENT, DEVELOPMENT AND STRUCTURE OF STANDS

See also Nos. 1084, 1101, 1105–9, 1112–3, 1115–22, 1201–1206, 1453–4, 1509.

1436. WECK. Forstliche Zuwachs- und Ertragskunde. [**The science of forest increment and yield.**]

Neumann Verlag, Radebeul and Berlin. 1948. pp. 92. 10 pp. of refs. [G.] Price *DM*4.50 [10*s*. 0*d*.].

A textbook designed to give students and practising foresters not only information on established facts but also enough knowledge to find their way about the still obscure or controversial parts of the subject. Includes a section on the determination of quality classes.

1437. WIEDEMANN, E. Ertragskundliche und waldbauliche Grundlagen der Forstwirtschaft. Teil II. Die übrigen Bestandesformen. Die Verjüngung. **[Silvicultural and growth studies as bases of forestry. Part II. The remaining forms of stand. Regeneration.]** J. D. Sauerländer's Verlag, Frankfurt a.M. 1951. pp. [4] + 129–233. [G.] Price [10*s*. 0*d*.].

Cf. *For. Abstr*. 13 (Nos. 537–8).

561. *Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology*

See also Nos. 1014, 1404, 1435, 1544.

1438. DOBBS, C. G. **A study of growth rings in trees. Part 1. Review and discussion of recent work.** *Forestry* 24 (1), 1951 (22–35). 32 refs.

Some key references are cited and discussed as a background to the paper, which is mainly concerned with work done since Glock's review in 1941 [cf. *For. Abstr*. 3 (350)] and with work in Great Britain not hitherto reviewed. It is pointed out that systematic study has been largely undertaken by archaeologists and climatologists rather than by foresters, and that the pioneer work of Douglass on the Yellow Pine in the dry climate of N. Arizona, which established a high degree of correlation between ring width and rainfall, has focussed undue attention on this. It is considered that, outside the region where rainfall can be shown to be a limiting factor in tree growth, the use of the single quantitative character of width is unreliable. In a study of growth rings of European Larch which will be published in a later issue of the same journal, it has been found possible to identify and date the annual growth layers by means of their qualitative characters and to simplify the growth pattern for presentation in terms of the frequency of multiple growth layers within the annual increment. *From author's summary*.

1439. GIDDINGS, J. L. **The forest edge at Norton Bay, Alaska.** *Tree-ring Bull*. 18 (1), 1951 (2–6).

Analysis of increment cores from 9 trees growing at a latitude of *ca*. 64° 30′ N. The governing factor controlling growth appears to be temperature of the growing season (June and July).

1440. OSWALT, W. **The origin of driftwood at Hooper Bay, Alaska.** *Tree-ring Bull*. 18 (1), 1951 (6–8).

The purpose of this study is to determine the origin of Spruce logs that have drifted ashore along a 3-mile section of the Bering Sea coast. When the origin of large quantities of driftwood has been established, this knowledge may aid in the study of northern ocean currents.

1441. **Ucar growth slow in dry forest.** *Carib. For*. 12 (1), 1951 (12, 29–30). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta*. 11, [1950?].)

Measurements of *Bucida buceras* in the dry limestone hills on the south coast of Puerto Rico (annual rainfall *ca*. 30 in.) show that diameter growth is slow and has been almost at a standstill for the past 2 years, with 31% of trees actually smaller in diameter than at the beginning of the period. This shrinkage is possibly due to desiccation from drought.

562. *Volume Increment*

1442. BRINKMAN, K. A. **Growth of a White Pine [*Pinus strobus*] plantation in Iowa.** *J. For*. 49 (6), 1951 (445).

566. *Yield Tables and Their Construction*

1443. VANSELOW, K. Fichtenertragstafel für Südbayern. Untersuchungen über Zuwachs, Ertrag, Stammformen und Struktur reiner Fichtenbestände in Südbayern. **[Spruce yield tables for southern Bavaria. A study of growth [including height curves], yield, stem form and structure of pure Spruce stands in southern Bavaria.]** *Forstwiss. Cbl*. 70 (7), 1951 (409–45). 13 refs. [G.]

1444. WILHELMI, T. Die Zuwachsleistungen von *Tectona grandis* nach Indischen und Niederl.-Indischen Ertragstafeln. **[The increment of Teak according to Indian and Netherlands-Indian yield tables.]** *Mitt. Bundesanst. Forst u. Holzw*. No. 20, 1950. pp. 11 + [8]. 10 refs. [G.e.f.]

Data for the top quality classes in India and Java show only slight differences. As in a previous paper [see *For. Abstr*. 12 (No. 2506)], increment in volume and dry wood substance is compared, using Weck's 'absolute height quality', with that of European species (Norway Spruce, Scots Pine, Beech and Oak). This could be done only for Teak in Java, since the Indian figures do not extend to the required age of 100 years.

1445. HUMMEL, F. C. **Studies of growth and yield.** *Rep. For. Res. For. Comm., Lond. 1949/50*, 1951 (61–70).

The rate of growth of free-grown Oak was investigated from measurements of some hundreds of trees, mostly in the Midlands and Southern England. The main points that emerged were as follows:— Height of free-grown Oak is usually low, and in order to obtain a satisfactory length of clean bole, green pruning is essential. Height varies, however, and may be up to 50 ft. in individual trees; it does not appear to be closely correlated with the rate of height growth. The average crown diameter in feet (C) of free-grown Oak trees is about equal to twice the quarter-girth at breast-height in inches (G) plus a constant of 4, i.e. $C = 2G + 4$. This relationship does not seem to vary appreciably with age, nor with the rate of height or diameter growth. It was therefore possible to estimate the maximum number of trees of any specified average girth that can be maintained, under conditions of free growth,

on one acre. The number at square spacing is given by the equation

$$N = \frac{43{,}560}{(2G + 4)^2},$$

where N is the number of trees per acre and G the average q.g.b.h. Stem analyses of several hundred trees indicated that exceptional free-grown Oaks may reach a q.g.b.h. of 25 in. in 100 years, and that averages of *ca.* 20 in. may be expected at that age in favourable sites.

By combining the above data, it was possible to construct a preliminary yield table for free-grown Oak in Britain. For quality-class II (there are likely to be very few quality-class I sites) the figures for yield/acre at 100 years are as follows:—Final yield, 1,460 Hoppus ft. over bark, spread over 26 trees with an average timber height of 28 ft. and q.g.b.h. of 20 in. Intermediate yield from thinnings after the 50th year, 1,250 Hoppus ft. over bark, derived from trees ranging between 11 and 18 in. q.g.b.h. A very small number of young trees, e.g. 26/acre for class II, is sufficient to achieve complete stocking at maturity. [Cf. *For. Abstr.* 12 (No. 842).]

568. *Other Mensurational Studies of Stand Constitution and Changes therein. Distribution of Growth by Tree Classes etc.*

See also Nos. 1063, 1430.

1446. **Changes in crown class rapid in improved stands.** *Carib. For.* 12 (1), 1951 (8–9, 25–6). [E. Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11, [1950?].)

A study of lower-montane rain forest in the Luquillo Mountains (Puerto Rico) demonstrated the rapid changes in crown-class representation that occur in the course of natural succession in secondary forest towards the climax. Crown-class representation is not therefore a good index of diameter growth over any considerable length of time, unless frequent fellings maintain a constant environment.

58. SURVEYING AND MAPPING (INCLUDING AERIAL SURVEYS)

See also Nos. 1301, 1375, 1772, 1785.

581/584. *Ground Surveys*

581. Field Work

1447. S[CHAEFER], L. La boussole forestière. [**The forestry compass.**] *Rev. for. franç.* 1951 (9), (589–91). [F.]

Describes an improved instrument designed for forest surveying and manufactured by H. Morin, 11 Rue Dulong, Paris.

582. Mapping. Technique of Drawing-Office and Subsequent Work

1448. SPEAR, G. A. **Photo-lithographed forest maps.** *For. Air Surv. Publ. For. Br. Can.* No. 7, 1951. pp. 14 + 1 map. 5 refs.

Describes the process of producing forest inventory maps by photo-lithographic methods. Advantages are the speed and low cost of reproduction and the high standards of colouring, stability, durability and fidelity of detail.

585/588. *Aerial Reconnaissance and Survey*

See also No. 1429.

1449. TOMAŠEGOVIĆ, Z. Savremena iskustva i rezultati šumarske fotogrametrije. [**Recent experience and results obtained in forest aerial photographic survey.**] *Šum. List* 75 (5), 1951 (193–201 + 1 photo, 1 dgm.). 4 refs. [Croat.e.]

A general survey, with special reference to work done in the U.S.A., U.S.S.R., Germany and Czechoslovakia.

1450. MIGNERY, A. L. **Use of low-altitude continuous-strip aerial photography in forestry.** *Occ. Pap. Sth. For. Exp. Sta.* No. 118, 1951. pp. 19. 12 refs.

Photographs were taken over an area in the second-growth upland Longleaf-Pine type in south Alabama using a continuous-strip aerial camera with a double lens to allow stereoscopic viewing of paired photo strips. A study showed that *Pinus palustris*, *P. caribaea*, *Cornus florida*, *Magnolia grandiflora*, *M. virginiana*, *Ilex glabra*, *Quercus marilandica*, and *Liriodendron tulipifera* can be identified on air photos. Other species showed no characteristic colours or patterns. Stem enumeration was subject to appreciable error. Height measurements by length of tree shadow were completely unsuccessful (the photographs were taken at midday), and those by parallax difference and by the displacement method proved insufficiently accurate. Crown diameters could be measured accurately only if the height of the maximum crown dimension above ground could be measured to allow of scale correction. Few trunks can be seen, but diameter measurements of 7 trunks on the outer edges of the strip gave readings 16 to 62% greater than field measurements. Site evaluation is superior to that from conventional air photographs, and in understocked areas reproduction and other small growth could be seen clearly.

Costs are not known. It is concluded that the method is not at present suitable for forest mensuration, that it will probably never be practical for large areas to be measured as a whole, but that with modifications it may be very useful for sampling.

1451. MOESSNER, K. E., BRUNSON, D. F., and JENSEN, C. E. **Aerial volume tables for hardwood stands in the Central States.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 122, 1951. pp. 15.

Gives stand-volume tables, based on a correlation of per-acre volumes from 484 plots measured in the field with measurements of the same plots made on air photographs, showing board-foot and cubic-foot volume per acre for stands of given total height, crown diameter and % crown coverage. Tests of the tables, comparing estimates by different photo-interpreters with ground estimates, show them to be reasonably accurate. The tables reflect coverage conditions over wide areas within the central hardwood region and require adjustment (as explained in an appendix) for local use.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also No. 1748.

61. FOREST MANAGEMENT: GENERAL, THEORY AND PRINCIPLES

1452. BOURNE, R. **A fallacy in the theory of growing stock.** *Forestry* 24 (1–2), 1951 (6–18; 159–61). 10 refs.

Discusses the advantages of the selection system and the different nature of the growing stock in selection forest and even-aged forest, the former carrying more large timber per acre than the latter. It is therefore fallacious to apply to selection forests, growing-stock figures calculated from yield tables computed from even-aged stands. Data for Chiltern Beech woods as well as Swiss figures are adduced.

1453. LEMPS, F. DE. **Volume critique, plan de balivage, et composition normale dans les taillis-sous-futaie. [Critical volume, marking plans, and normal composition in the management of coppice-with-standards.]** *Rev. for. franç.* 1951 (9), (552–72). [F.]

The author discusses in detail the conception of a 'critical volume' of reserved standards which must be kept to if the regression of Oak in French coppice forests is to be stopped. He gives data derived from experiments to show that: (1) Oak regeneration can be obtained only under gaps in the canopy made in a mast year; and (2) reproduction so obtained will not survive without several cleanings and release in the course of the current coppice rotation. The notion therefore, that rigid marking plans alone are sufficient to stop the regression of Oak, is fallacious. He would substitute the conception of a 'normal' stand, and presents a tentative schedule for such a conception for 5 site-fertility classes, giving desirable m.a.i., mean g.b.h. increment per cycle, exploitable age limit and exploitable girth limit for the standards.

1454. MONZON Y MOSSO, C. **Monte bajo. [Coppice.]** *Montes, Madrid* 7 (39), 1951 (157–64). [Span.]

Presents a study in the coppice management of *Quercus toza* stands, based on data gathered from sample plots in Soria province, Spain. A cycle of 30 years is considered advisable for such stands in this region. It is estimated that at an age of 30 years, production of larger wood is *ca.* 20 kg. per stem. Taking into account the present state of the forests in Soria, and assuming the number of stems per ha. at 30 years to be 2,900, with an average d.b.h. of 9·07 cm., the spacing of a stand of normal density at 30 years should be *ca.* 20 m. Starting from these data, the normal development of the stands at intermediate stages is calculated and management practices are prescribed. In a managed stand with a felling cycle of 30 years, each year a felling should be made in that part of the forest attaining 30 years of age, along with cleanings in the sections attaining 10 and 20 years of age. Yields from a forest managed on this basis are estimated.

62. WORKING PLANS. ANNUAL OR PERIODIC YIELD. YIELD REGULATION

See also Nos. 1452–3.

1455. RODENWALDT, U. **Reviergeschichte als eine Grundlage der Waldbauplanung. Die Entwicklung der gräfl. Erbach-Erbachschen Waldungen im Odenwald. [The history of the forest district as a basis of management planning. The development of the Erbach-Erbach forests in the Odenwald.]** *Forstwiss. Cbl.* 70 (8), 1951 (469–514). 30 refs. [G.]

Presents a fairly detailed history of the forests as an illustration of the way in which such past history can help in drawing up management plans. The historical study includes political and vegetational aspects, management, exploitation, legislation and the present status of individual species in the forest.

1456. HALLIN, W. E. **Unit area control in California forests.** *For. Res. Notes Calif. For. Range Exp. Sta.* No. 77, 1951. pp. 6 + 2 dgms.

The principles of unit-area control, in which the essential characteristic is detailed control of stocking on small homogeneous natural areas in the forest, are discussed briefly and illustrated from a 6-acre sample area of the Stanislaus Experimental Forest.

1457. BRASNETT, N. V. **Comment on 'A new method of volume regulation'.** *J. For.* 49 (8), 1951 (582).

Cf. *For. Abstr.* 13 (No. 560).

1458. LALOG, N. P. **Suggested changes in determining the allowable cut applicable to Philippine dipterocarp forest.** *Philipp. J. For.* 6 (3), 1951 (285–307). 5 refs.

65. SPECIAL BUSINESS PROBLEMS OF TIMBER-GROWING. CALCULATION OF COSTS AND PROFITABILITY. VALUATION

See also Nos. 885, 1100, 1173, 1179, 1209, 1279, 1317, 1778, 1785.

1459. BUSSE, J. **Schlüssel zur Waldwertrechnung: Formeln und Lehrbeispiele. [Key to forest valuation: formulae and instructional examples.]** Eugen Ulmer in Stuttgart (z. Z. Körnerstr. 16, Ludwigsburg). 1948. pp. 77. [G.] Price [10*s.* 0*d.*].

A reference booklet of formulae used in forest valuation and finance (interest, summation of rentals, expectation values etc.), with worked examples. Includes a list of symbols used, an example of a money yield table, and ready-reckoner tables for interest and rentals.

1460. COOK, D. B. **Justifications for forest pruning in the northeast.** *J. For.* 49 (7), 1951 (487–9). 7 refs.

Discusses the economic advantages of pruning.

1461. LORENZ, R. W. **Thinning returns from an eastern White Pine plantation in Ogle County.** *Transactions of the Illinois State Academy of Science, Springfield* 41, 1948 (39–42). C.G.B.

Presents the results of studies made in four ¼-acre sample plots to determine thinning yields and net stumpage.

1462. VILLEGAS DE LA VEGA, R. Influencia de la repoblación forestal con especies de crecimiento rápido, en la ecònomía de la provincia de Santander. [**The influence of reforestation with rapid-growing species on the economy of Santander province.**] *Montes, Madrid* 7 (39), 1951 (179–81). [Span.]

Between 1942 and 1950, 5,000 ha. of Santander have been reforested with quick growing species. Assuming an average annual production per ha. of 20 cu.m. for Eucalyptus and of 12 cu.m. for *Pinus radiata*, and an average price for standing timber of 150 *ptas.* and 225 *ptas.* respectively, per cu.m., the forests should soon be giving an annual yield worth 14,145,000 *ptas.*

1463. MILLAR, J. B. **Present value of immature stands.** *For. Chron.* 27 (2), 1951 (136–9).

Describes briefly three methods of valuing young stands, used respectively by the Nekoosa-Edwards Paper Co. of Wisconsin [cf. *For. Abstr.* 10 (No. 2351)], the North Star Paper Co. in Minnesota (based primarily on the use of air photographs and % of crown closure determined from them), and the William Bonifas Lumber Co., Michigan (based on growth rings per inch and stems per acre).

1464. WHITMAN, J. A. **Some basic legal aspects of forest damage appraisals.** *J. For.* 49 (7), 1951 (515–7). 19 refs.

Summarizes the U.S. law of contracts, trespass, evidence and damage, as it may be relevant to the appraisal for forest damage.

66. COSTING OF LOGGING OPERATIONS

See also Nos. 1265, 1275, 1577.

1465. REYNOLDS, R. **Pulpwood production costs in southeast Arkansas, 1950.** *Occ. Pap. Sth. For. Exp. Sta.* No. 121, 1951. pp. 17. 2 refs.

68. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See Nos. 885, 1745, 1758, 1781.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

See also Nos. 1015, 1265, 1577–8, 1788.

1466. MELLINS, L. Die Forst- und Holzwirtschaft der Baltischen Staaten. **[Forestry and wood products in the national economy of the Baltic States.]** *Mitt. Bundesanst. Forst- u. Holzw.* No. 18, 1950. pp. [2] + 45 + [8]. 141 refs. [G.e.]

A dissertation, the main chapters of which deal with: natural conditions of the region from the economic point of view; the forests and their management; the wood industries; the timber trade; present position and future prospects.

71. MARKETING OF FOREST PRODUCTS: GENERAL

1467. **The timber trades directory, containing classified lists of firms engaged in the timber and allied trades throughout the world.** The Timber Trades Journal Office, Bouverie House, 154, Fleet Street, London, E.C.4. 15th ed., 1950. pp. cccviii + 777. Price 42*s*.

72. THE QUANTITATIVE ASPECTS OF MARKETING. DEMAND, CONSUMPTION AND SUPPLY

1468. KELLER, J. Aktuelle Fragen der schweizerischen Holzwirtschaft. **[Present problems of the Swiss timber trade.]** *Schweiz. Z. Forstw.* 102 (7), 1951 (331–40). [G.f.]

Discusses the disequilibrium of demand and supply of softwood sawtimber and its effect on the price structure.

1469. **Forest industries of Brazil.** Ministry of Foreign Affairs, Cultural Division, Rio de Janeiro. 1949. pp. 112.

Notes on the following industries, with production statistics: oils (fixed), waxes, gums, resins and essential oils, timber (giving the properties and characteristics of some Brazilian woods), cellulose, textile fibres, tannin, vegetable insecticides and medicinal plants.

1470. SCHEYE, K. G. **Analysis of pulp and paper industry and the raw material supply.** *Paper Tr. J.* 130 (7; 11; 14; 17; 22), 1950 (33–8; 17–20; 23–4, 26; 23–4, 26–7; 12, 14, 16–8); 131 (3), 1950 (36, 38, 40, 42). 62 refs. P.R.

A detailed survey of supplies of raw material in the American pulp and paper industry. The U.S. cannot rely on foreign sources, and only large-scale tree farming in the south, midwest and west can guarantee a perpetual supply. Foreseeable changes seem to favour the large corporations. The urgency of planned forest management is stressed.

73. PRICES

See also No. 1468.

1471. SJÖQUIST, C. A. Försök till analys av tidsserier baserade på försäljnings- och omkostnadsvärden inom Nedre Norrbottens distrikt åren 1935–1946. **[An attempt to analyse [wage and price] time series based on sale and cost values in the Nedre Norrbotten district, 1935–46.]** *Svenska Skogsv-Fören. Tidskr.* 49 (1), 1951 (81–99). 4 refs. [Sw.]

75. TRADE CUSTOMS AND USAGES

1472. LYNCH, D. W., and CHAPMAN, R. A. **Sampling in tree measurement sales on northern region national forests.** *Sta. Pap. Nth. Rocky Mt. For. Range Exp. Sta.* No. 27, 1951. pp. 47. 12 refs.

Samples were taken from scale books of sales by tree (as opposed to log) measurement in Ponderosa Pine, Douglas Fir and Western Larch stands, and the total sale volume thus calculated was compared with the actual recorded volume. The study showed that sampling in tree-measurement sales gives reasonably accurate results. There is an estimated saving, over measuring all trees sold, of about 10 cents a tree. Graphs are given showing the number of trees needed in the sample for different degrees of accuracy, different numbers of trees in the sale, and variations in tree volumes, at 68% probability. Stratified sampling (e.g. sampling large and small trees independently) reduces the sample size needed for a given accuracy. Check scaling (scaling the logs of certain full-length trees after felling and dividing the scaled volume by the volume of the same trees as calculated standing) can be used to determine a correction factor; sampling requirements for this also were investigated.

8. FOREST PRODUCTS AND THEIR UTILIZATION

1473. THUNELL, B. Neuere Ergebnisse der holztechnologischen Forschung in Schweden. **[Recent results of technological wood research in Sweden.]** *SchrReihe öst. Ges. Holzforsch.* No. 2, 1950 (51–74). [G.] P.R.

1474. GARLAND, H. **State forest products research in Michigan.** *Paper Tr. J.* 130 (7), 1950 (22–4). P.R.

A survey.

81. WOOD AND BARK: STRUCTURE AND PROPERTIES

1475. TIEMANN, H. D. **Wood technology: constitution, properties, and uses.** Sir Isaac Pitman & Sons, Ltd., London. 3rd ed., 1951. pp. xvii + 396. Price 30*s*.

[Cf. *For. Abstr.* 8 (No. 1079).] New features are a discussion of the phenomenon of collapse and a humidity diagram.

810. *General Information on Woods*

See also Nos. 988, 1012, 1018, 1114, 1469, 1599.

1476. SCOTT, M. H. **The quality and uses of exotic softwoods.** *Emp. For. Rev.* 30 (3), 1951 (235–49 + 12 photos).

Describes the timbers of the exotic Pines grown in S. Africa and the uses to which plantation thinnings have been put. A critical evaluation of this

comparatively fast-grown wood is made on the basis of strength, workability and defects. The various grades of structural and factory timbers are described and a comparison made between locally grown and normal grade of imported softwoods.

1477. THOMAS, A. V. **Malayan timbers.** *Malay. Forester* 14 (2; 3), 1951 (91–4; 152–4 + 2 photos).

Properties and uses of the timbers of 6 species of *Sindora* occurring in the Malay Peninsula and known by the common name of Sepetir; and of the timber of numerous species of *Hopea*, that goes under the name of Merewan.

1478. LEBACQ, L., and ISTAS, J. R. Les bois des Méliacées du Congo Belge. **[The woods of the Meliaceae of the Belgian Congo.]** *Annales du Musée du Congo Belge, Tervuren (Belgique): Sciences historiques et économiques* 2, 1950. pp. 127 + 2 tbls. 25 refs. [F.]

Detailed descriptions, including chemical analysis, illustrated by 125 microphotographs.

1479. **Specimen woods Nos. 186–9.** *Suppls.* to *Wood* 16 (6–9), 1951 (223–4; 265–6; 305–6; 347–8).

San Domingo Boxwood (*Phyllostylon brasiliensis*); Ramin (*Gonystylus warburgianus*); African Mahogany (*Khaya* spp.); and Abura (*Mitragyna ciliata* and *M. stipulosa*).

1480. KEYLWERTH, R. Holzeigenschaftstafeln **[Tables of wood properties.]** *Holz Roh- u. Werkstoff* 9 (2; 3; 5), 1951 (79–80; 119–20; 211–2). 10 + 11 + 13 refs. [G.] P.R.

The first instalments of a series of features published irregularly in this journal, giving for each species the following information: general (name, habitat, locality, trade), external appearance (tree, wood, defects), wood structure (vascular tissue, storage tissue, wood fibres), physical properties, mechanical strength, machinability, durability, protection, chemical properties, and uses. The sources of information or data are indicated in a short bibliography. Species covered in the present instalments are: *Turraeanthus africana*, *Gossweilerodendron balsamiferum*, and *Araucaria angustifolia*.

1481. **[Colonial timbers.]** *Bois For. Trop.* No. 17, 1951 (33–40). [F.]

Amarante (*Peltogyne* spp., chiefly *P. venosa* and *P. paniculata*) and Wapa (*Eperua* spp., chiefly *E. falcata* and *E. jenmani*).

1482. LAMB, G. N. **Foreign woods: origin, use, properties and nomenclature.** *Wood Prod.* 56 (5), 1951 (38–9).

Erun (*Erythrophleum* spp.), Ilomba (*Pycnanthus kombo*), Niove (*Staudtia* spp.), and Wallaba (*Eperua* spp.).

1483. LAMB, G. N. **Foreign woods.** *Wood, Chicago* 56 (8), 1951 (6, 40). P.R.

Cortez (*Godmania aesculifolia*); White Dup (*Canarium euphyllum*); Morillo (*Trophis* sp.); East African Olive (*Olea hochstetteri*).

1484. GERRY, E. **Information Leaflet. Foreign Woods. Angelique or Basra Locus. *Dicorynia paraensis* Bth. (= *D. guianensis* Amsh.). Family: Leguminosae.** *Rep. U.S. For. Prod. Lab., Madison* No. R1787, 1950. pp. 7. 5 refs. P.R.

1485. RYMER, K. W. **Red Alder in British Columbia.** *Bull. For. Br. Can.* No. 98, 1951. pp. 19. 7 refs.

A brief account of the properties, manufacture, uses, and silvicultural characteristics of *Alnus rubra*.

1486. **Turpentine.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 5 (1), 1951 (3–6).

Discusses the properties and uses of *Syncarpia laurifolia*, with notes on its distribution and a botanical description.

1487. SCHMIDT, E. Übersee-Hölzer No. 27. Pockholz. **[Foreign woods No. 27. *Guaiacum officinale* L.]** *Suppl.* to *Weltholzw.* 3 (4/5), 1951. pp. 2. [G.] P.R.

811. *Structure. Identification*

1488. EECKHOUT, L. Beknopt overzicht van de terminologie gebruikt bij de anatomische beschrijving en de identificatie van de houtsoorten. **[A brief survey of the terminology used in the anatomical description and identification of wood species.]** *Meded. Lab. Houttechnol., Gent* No. 3, 1951. pp. 38. 25 refs. [Flem.f.e.g.]

Defines, with illustrations, 112 terms used in wood anatomy, giving equivalent terms in French, English and German. There are indexes in all 4 languages.

1489. EECKHOUT, L. De beschrijving en de identificatie van de houtsoorten. **[The description and the identification of timbers.]** *Meded. Lab. Houttechnol., Gent* No. 5, 1951. pp. 28. 26 refs. [Flem.flem.f.e.g.]

Discusses the method of describing macroscopic and microscopic features used at the laboratory, and gives a specimen description of the wood of *Alstonia congensis*.

1490. JOHNSTON, D. R. **Structure drawings to 'Specimen Woods'.** *Wood* 16 (7–9), 1951 (264; 304; 349).

This series of structure drawings with descriptions, relates to woods published in 'Specimen Woods'. The sequence of publication follows that of the original order of the plates except when more than one specimen of a species has been illustrated. Drawings and descriptions are kept to more or less gross features.

Woods dealt with in these three numbers are: (1) Indian Laurel (*Terminalia tomentosa*), Queensland Walnut (*Endiandra palmerstoni*), Western Red Cedar (*Thuja plicata*), and Sapele (*Entandrophragma cylindricum*).

(2) Makore (*Mimusops heckelii*), Teak (*Tectona grandis*), Douglas Fir (*Pseudotsuga taxifolia*), and Andaman Padauk (*Pterocarpus dalbergioides*).

(3) Silky Oak (*Cardwellia sublimis*), European Elm (*Ulmus procera*), Obeche (*Triplochiton scleroxylon*), and Agba (*Gossweilerodendron balsamiferum*).

1491. COZZO, D. Claves para el reconocimiento anatómico del leño secundario de las Leguminosas argentinas. **[Keys for the identification of the Argentine Leguminosae from the anatomy of the secondary wood.]** *Repr.* from *Rev. argent. Agron.* 18 (2), 1951 (78–97). [Span.span.] E.M.B.

1492. Inokuma, T., and Shimahi, K. **Dendrological and wood anatomical notes on Yukunoki (*Cladrastis shikokiana* Makino) and Fujiki (*Platyosprion platycarpum* Maximowicz).** *Bull. Tokyo Univ. For.* No. 38, 1950 (123–38 + 16 photos, 1 map). 15 refs. [Jap.e.]

A study of the winter buds, the ray types and the vessel arrangement of Yukunoki, Fujiki (*Platyosprion platycarpum* Maximowicz = *Cladrastis platycarpa* Makino) and other *Cladrastis* spp., indicates that Fujiki represents the monotypic genus *Platyosprion*, leaving Yukunoki, *C. lutea*, *C. sinensis* and *C. wilsonii* in the genus *Cladrastis*.

811.1. Anatomical Elements and Tissues

See also Nos. 1051, 1514, 1532, 1544, 1576, 1702.

1493. Wardrop, A. B., and Preston, R. D. **The submicroscopic organization of the cell wall in conifer tracheids and wood fibres.** *J. exp. Bot.* 2 (1), 1951 (20–30 + 8 photos). 22 refs. O.B.D.

Presents the results of a study of the birefringence observed in sections cut at various angles to the radial longitudinal plane. It was shown that the optical heterogeneity observed in transverse section is traceable to 2 factors: (1) the outer layer of each tracheid is composed of cellulose chains lying in a rather flat spiral, though not transverse, at an average angle of some 50° to the cell length; in the thicker central layer the spiral is much steeper, with an angle of ca. 20°. (2) At the same time, the birefringence of both layers is reduced in virtue of both high lignin content and high angular dispersion, the dispersion being considerably greater in the outer layer.

It is presumed that this high angular dispersion in the outer layer is responsible for the lack of any record of this layer in the X-ray diagram, and its failure to make any marked contribution to the optical properties of the wall in face view. *From authors' summary.*

1494. Bannan, M. W. **The annual cycle of size changes in the fusiform cambial cells of *Chamaecyparis* and *Thuja*.** *Canad. J. Bot.* 29 (4), 1951 (421–37). 10 refs. P.R.

In stems exceeding a few inches in diameter, most of the pseudo-transverse divisions involved in the multiplication of fusiform cambial cells occur toward the end of the growing season. Often these aestival transverse divisions are immediately followed by extensive elongation of the new-formed cambial cells, especially at their overlapping tips. In the succeeding year relatively slight elongation ensues during the development of the first quarter of the annual ring, but through the succeeding quarters the amount of extension increases and is usually maximal in the final quarter. The actual rates of elongation remain undetermined. The multiplication of fusiform initials is accompanied by loss, most of the failure taking place during the last quarter. Generally the fusiform initials with the most extensive ray contacts survive and enlarge, and those with poor ray associations fail or are reduced to potential ray initials. The elongation and multiplication of fusiform initials tend to produce local ray deficiencies. Reduction of the fusiform initials with the poorest ray contacts to ray initials, rectifies to a varying extent the ray shortages in those areas. *Author's summary.* [Cf. *For. Abstr.* 13 (No. 608).]

1495. Eeckhout, L. **On the definition of compound rays in wood anatomy.** *Meded. Lab. Houttechnol. Gent* No. 6, 1951. pp. 16. 16 refs. [E.]

Discusses the definitions and classification of ray types by different authorities. [Cf. *For. Abstr.* 13 (Nos. 613–6).]

1496. Suzuki, K., Nagata, J., and Okamoto, K. **Research on ray and tracheid of wood of 'Sawara', *Chamaecyparis pisifera*.** *Bulletin of the College of Agriculture, Utsunomiya University, Japan* 1 (1), 1950 (43–63). [E.Jap.] C.G.B.

Presents in the form of graphs and tables the results of anatomical research carried out on 7 trees (age 56–95 years), the test specimens having been taken at 2 m. from ground level. Two-cell rays are commonest. There are on the average 6,683 rays/sq. cm. in T.L.S. Ray height is nearly proportional to the number of cells. The average cell height varies from 14·7μ (12-cell rays) to 21·7μ (single-cell rays). The ray width in longer rays is *ca.* 10μ. In the case of the narrowest annual ring (112μ), summerwood forms 35·7 and springwood 64·3% of the width, while in wider annual rings summerwood drops to 7–8 and springwood rises to 92–93%. The summerwood and springwood percentages of numbers of cells, based on an actual cell count, are 50 and 50% for an annual ring width of 112μ, and 17–19 and 81–83% respectively for wider annual rings. The radial width of springwood cells varies between 14 and 46μ, and that of summerwood between 4 and 22μ.

811.2. Special Features and Abnormal Structure

See Nos. 1383, 1499, 1520, 1544.

811.7. Phloem. Bark

1497. Ceruti, A. **La struttura submicroscopica delle membrane suberificate di castagno. [The submicroscopic structure of the suberified tissues of *Castanea sativa*.]** *Atti della Academia nazionale dei Lincei, Roma (Ser. 8)* 8 (5), 1950 (495–8). [It.] I.I.E.

Bark was carefully removed from young twigs of *Castanea sativa* and samples were subjected to a number of different chemical treatments and then examined under ordinary, fluorescent, and polarized microscopes. Six strata were distinguished in the cork layer: Stratum V (the innermost), which was in contact with the phellogen, was distinguished by the presence of nucleus and cytoplasm, suberified tissues, and waxes distributed normally in the tissues. In the next stratum (IV), nucleus and cytoplasm were undifferentiated, but the tissues were suberified and the waxes distributed as in (V). Stratum (III) showed suberified tissues, but almost no wood. Stratum (II) was very like (III), but composed of smaller elements and with no wax at all. Stratum (I) displayed even smaller elements, and the tissues were partly cellulosic, with little or no suberification. This was again distinguished from (O), the most superficial layer, which was in process of disintegration. [Cf. *For. Abstr.* 13 (No. 968).]

812. *Physical and Mechanical Properties*

See also Nos. 1510–2.

1498. STOJANOV, V., and ENČEV, E. Sravnitelni izučivanija vărhu tehnologičnite kačestva na bukovata. [**Comparative studies on the technological properties of Beech woods.**] *Sbornik na Bălgarskata Akademija na Naukite, Klon prirodo-matematičen, Sofia* 40 (20), 1949 (99–229). [Bulg. e.] D.S.I.R.

Beech forests (*Fagus sylvatica* and *F. orientalis*) occupy 19·7% of the total forested area of Bulgaria, and represent nearly half of the wood reserves. Physical and mechanical properties were studied on specimens from 13 trees (3 of *F. orientalis* and 10 of *F. sylvatica*) taken from 6 localities. In the following, the first figure will refer to *F. orientalis*, and that in brackets to *F. sylvatica*. Sp. gr.—green wood 1·015 (0·984), kiln-dry 0·729 (0·671), air-dry (moisture content 14·38%) 0·761 (0·716); strength in compression along the grain (moisture content 14·04%), 563 (521) kg./sq cm.; bending strength (moisture content 12·15%), 1,147 (1,105) kg./sq. cm.; tensile strength along the grain (moisture content 13·66%), 1,354 (1,285) kg./sq. cm.; torsion strength 256 (225) kg./sq. cm.; work done to rupture (moisture content 12·49%), 0·93 (0·85) mkg./sq. cm.; hardness along the grain (after Janka, air-dry wood, moisture content 12·82%), 820 (770) kg./ sq. cm. Data for some properties of samples taken from various parts of the tree, from various localities, and of samples with different moisture contents, are also analysed.

1499. SŁAWIŃSKI, W. Właściwości komponentów drzewnych buczyn zamojskich (*Fagetum zamosciense*) i spis pospolitszych gatunków flory mikologicznej atakującej drzewa. [**Properties of the trees composing the Zamosc Beech forests (*Fagetum zamosciense*) and a list of common fungus species attacking them.**] *Ann. Univ. M. Curie-Skłodowska, Lublin* (*Ser. E*) 3 (3), 1948 (49–61 + 6 photos). 58 refs. [Pol.e.] A.P.B.

Various theories and explanations of 'frost-heart' and 'false (red) heartwood' in Beech [cf. *For. Abstr.* 12 (Nos. 3067–8)] are surveyed. Apart from the theories of Hartig, Tuzson, Münch, and also Vanin and other Russian authors, special attention is paid to the papers in Polish by Krzysik (1931–7), and Haus (1937). The former thinks that the false heartwood can also be due to frost, while distinguishing between false heartwood proper and frost-heart. Trees with frost-heart also have tyloses and colouring matter in the vessels. The frost-heart presents a brown or yellowish zone, and is a transitional stage to false heartwood. Haus distinguishes between: (1) sapwood (white), (2) recent frost-heart (light-yellow), (3) frost-heart (brown), (4) false heartwood (cherry red). Various combinations of the above stages are possible. Haus asserts that, irrespective of all other factors, low temperature (below a certain minimum) is the most important and essential cause of coloured zones in Beechwood. It seems (Krzysik) that the formation of false heartwood is a defence mechanism of the Beech against destructive external factors, although this defence cannot last long. Beech is very susceptible to frosts (longitudinal cracks); in summer, bursting of the sap-swollen peripheral layers is also observed. The paper contains tables of: (1) weight per unit of volume (kg./cu.m.) of Beech billets, round timber, brushwood, and stump wood, both green and air-dry; (2) physical and mechanical properties of Beech wood (comparative data of about 10 authors); and (3) sp. gr. of various portions of Beech wood according to Krzysik (the sets of 4 figures that follow refer to average wood, sapwood, frost-heart, and false heartwood respectively): kiln-dry 0·801; 0·718; 0·702, 0·664; air-dry 0·740 (average value only); green wood 0·953; 1·050; 0·944; 0·667; moisture content immediately after felling: 71·1; 89·6; 70·4; 53·2%. The Beech forests of Zamosc often contain Hornbeam as a subsidiary species; most of these Hornbeams have spiral grain, the cause of which is unknown. The influence of Beech on the development of Birch, Aspen, and Lime stems is adverse. Their lower portions are asymmetrical, have bends and anomalous swellings, possibly attributable to deficient illumination. The wood of these abnormal trees differs considerably from normal. Its kiln-dry sp. gr. is much higher, water absorption is less, giving up of water is slower, drying and swelling less than with normal wood. Its mechanical properties are, as a rule, more favourable. A list of 14 fungi attacking Beech, Hornbeam, Birch, Lime, Aspen, Willow and Alder is appended.

1500. SMEATHERS, R. **A comparative study of some of the more important mechanical and physical properties of Trinidad and Burma grown Teak (*Tectona grandis*).** *Inst. Pap. imp. For. Inst., Oxf.* No. 27, 1951. pp. 19. Price 2*s.* 6*d.*

The timber now being grown in the Teak plantations of Trinidad is in no way inferior to that represented by a sample of Burma-grown Teak obtained from a commercial source, in the mechanical and physical properties tested (static bending, compression parallel to grain, toughness, tension parallel to grain, hardness, and sp. gr.), and in some cases proved to be significantly stronger. A positive correlation existed between all strength properties and sp.gr. A further investigation is recommended to determine the correlation between sp. gr. and rate of growth.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 1543, 1645–7.

1501. GRAF, S. H. **Ignition temperatures of various papers, woods and fabrics.** *Bull. Ore. Engng. Exp. Sta.* No. 26, 1949. pp. 69. 19 refs. P.R.

The bulletin is based on data obtained with semi-automatic apparatus carefully designed to give conditions easily duplicated and comparable to those that could exist in a storage warehouse or a similar building. The substances were tested under conditions of variable specimen weight, variable heating rate, variable air flow, variable atmosphere composition, and variable humidity, in an effort to obtain the minimum ignition temperatures. The general trend was toward lowered ignition temperature with increase in sample size, with decrease in heating rate, and with increase in oxygen concentration of the

atmosphere. There was in most cases an optimum air flow for the lowest ignition temperature, but there was little or no effect on the ignition temperature by low concentrations of water vapour, sulphur, and gasoline fumes. *From author's summary.*

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 1519, 1532, 1619–20, 1664, 1666, 1671.

1502. **Excess moisture in wood.** *Wood Prod.* 56 (6), 1951 (17–9).

The Laucks Sentry, manufactured by the Technical Instruments Division, Laucks Laboratories Inc., Seattle, Washington, is an electronic device which automatically rejects or marks stock at or above any given moisture content. It is designed for use by furniture and veneer manufacturers, but can be adapted for other processes. The electronic brain of the device is housed in a 19½ × 29½ × 17½-in. metal case. A set of electric probes is permanently installed at some place where there is a regular flow of material. This control unit, which has a sensitivity of 0·1%, can be set at any moisture content, and will detect a wet spot in any part of the stock. It works equally well on any species and on stock of any normal thickness. It has been successfully used by a firm of furniture manufacturers for a year.

1503. RIETZ, R. C. **F.P.L. Clinic. Problem No. 6. What is meant by 'EMC' [equilibrium moisture content] and where is knowledge of it useful in the process of handling and fabricating lumber?** *Wood-Worker, Indianap.* 70 (4), 1951 (32). P.R.

1504. NOWAK, A. **Swelling process in wood.** *Transl. For. Prod. Aust.* 1951. pp. 10. 10 refs. Transl. by P. Steedman from *Mitt. öst. Ges. Holzforsch.* 2 (2), 1950 (9–12). [Cf. *For. Abstr.* 12 (No. 1166).] P.R.

1505. KABURAGI, Z. **Forest-biological studies on wood quality. Report 1. On the moisture content, bulk density and shrinkage of early and late wood of green Todo Fir, in the Nopporo district of Hokkaido.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 46, 1950 (37–70). 8 refs. [Jap.jap.e.]

Results of studies on the distribution of moisture content in the early and late wood of heartwood and sapwood of *Abies mayriana*, on the density of early and late wood and its relationship to the width of the annual ring, and on shrinkage in early and late wood and in the 'whole wood', are given in graphs and tables.

1506. KANO, T. **Forest biological studies on wood quality. Report 2. Hygroscopicity of Todo Fir (*Abies mayriana* Miyabe et Kudo) lumber.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 46, 1950 (71–110). 31 refs. [Jap.e.]

The results of study on shrinkage are discussed and given in graphs and tables. Data given relate to: the shrinkage curve for Todo at various moisture contents; the effect of wood condition (green, air-dry, compression wood and wood exposed in the open over a long period) on the shrinkage curve; the hysteresis of moisture equilibrium; the effect of wood condition on moisture equilibrium; the effect of repeated shrinkage; and the deformation of the wood cell.

1507. NARAYANAMURTI, D., RANGANATHAN, V., and RATRA, R. S. **Diffusion in wood. 1. Diffusion of ions through some Indian timbers.** *Indian For.* 77 (9), 1951 (587–99 + 2 plates). 8 refs.

A simple diffusion cell (which can be easily constructed from perspex sheeting) for studying the passage of molecules, ions, gases, vapours and liquids through wood and other membranes, is described. The diffusion of ions through some species of Indian timbers under a variety of conditions has been studied. The results show that the diffusion of ions through wood obeys Fick's law as long as the ion does not react with any constituents of the wood. In other cases there is deviation from this law. The diffusion constant is largest in the axial and smallest in the tangential direction. For the species tested (*Canarum strictum, Cullenia excelsa, Shorea robusta, Boswellia serrata, Bombax malabaricum, Vateria indica* and *Adina cordifolia*) ionic diffusion is higher through sapwood than through heartwood. The rate of diffusion of ions increases with increase in temperature.

1508. JOY, F. A., QUEER, E. R., and SCHREINER, R. E. **Water vapor transfer through building materials.** *Bull. Pa. Engng. Exp. Sta.* No. 61, 1948. pp. 82 + (6). 6 refs. P.R.

Report of an investigation in which the rates of water vapour transfer through 6 basic building materials (including wood and structural insulating board) were determined by means of a specially designed apparatus. In a study of the mechanism and laws of vapour transfer, observations were made on the permeability of wood and insulating board under a variety of conditions. The permeability of wood (and of some structural insulating boards) varies over a wide range depending upon the relative humidity in all parts of the vapour path. *From authors' summary.*

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 988, 1505, 1512–5, 1643.

1509. HIRAI, S. **Studies on the wood density of forest trees (III). *Cryptomeria japonica* D. Don of Daigo District, Ibaragi Prefecture.** *Bull. Tokyo Univ. For.* No. 39, 1951 (219–34). 5 refs. [Jap.jap.e.]

[Cf. *For. Abstr.* 13 (Nos. 553, 630).] The distribution of density within the stems of four 56-year-old sample trees was examined and the weight increments of individuals and of the stand were calculated, with the following results: The frequency curves for the densities of individual trees varied considerably in shape, but the total curve indicated a 2-peaked type. Some general tendencies were found as regards distribution of density. The wood was heavy at the central part of the base and top of the tree, the heavy area at the top extending downwards through the centre. Lighter wood was formed extensively round the centre, below ⅓ to ½ of tree-height. A sheath of heavy wood was formed at 30–40 years, with light wood outside it. The wood at the butt swelling was extremely light. There was

no direct correlation between ring width and bulk density. The weight and volume increments of the samples ran almost parallel. The bulk densities of the individual trees, obtained by dividing the weight by the volume-increment, were 287, 285, 342 and 373 with an average of 322 kg./cu.m. The inferior trees tended to have the heavier wood. The total yield per ha. of the stand was 147,777 kg., and 473·45 cu.m.; the average annual yield per ha. was 2,639 kg., and 8·45 cu.m.

812.7. Strength Properties

See also Nos. 1561, 1576, 1599–1600, 1710.

1510. WATANABE, M., and CHEN, L. C. **The physical properties of Manchurian woods. (I).** *Bull. Tokyo Univ. For.* No. 30, 1942 (1–22). [Jap.jap.]

Accounts of standard tests on small specimens (dimensions given) of 20 native species, including 5 conifers.

1511. WATANABE, M. **The physical properties of Manchurian woods. (II).** *Bull. Tokyo Univ. For.* No. 31, 1943 (95–119). [Jap.jap.]

Results, which are tabulated and graphed, are given in metric units and Arabic numerals.

1512. SCOTT, M. H., and PLESSIS, C. P. DU. **The qualities of the wood of *Pinus taeda* grown in South Africa.** *J. S. Afr. For. Ass.* No. 20, 1951 (19–30 + 5 photos). [E.e.]

To enable the Department of Forestry to give full consideration to the desirability of continuing the planting of *Pinus taeda*, it was necessary to obtain an accurate evaluation of the qualities of the wood of this species. Representative trees from widely differing localities were therefore selected, sawn, seasoned, and tested at the Forest Products Institute. The results of tests on 2,000 cu. ft. of timber indicate that the wood seasons as well as other important Pine species; that there is not an excessive waste from typically crooked stems; and that *P. taeda* has the full strength required for the normal building or box timber.

Figure for yields of structural and factory timber are given, and the importance of pruning the basal logs emphasized.

It is shown that the variations in weight and strength of *P. taeda* follow the general pattern for other locally grown Pines, and a comparison with other species is made.

The lighter and milder qualities of the wood from Jessievale are an advantage and are comparable with those of *Pinus patula*; material from Port Durnford resembled the heavier type of Douglas Fir, and some of it was difficult to nail.

It was found that wood from Port Durnford grew heavier with increasing age of the tree. This increase showed little sign of falling off at 25 years of age at a height of 22 ft. up the stem.

1513. WOOD, L. W. **Variation of strength properties in woods used for structural purposes.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1780, 1950. pp. 11 + 21 gphs., 3 tbls. P.R.

A survey of the variability of strength properties in Southern Yellow Pine, Douglas Fir, Sitka Spruce, Western Hemlock, Eastern Hemlock, Ponderosa Pine, White Oak, Northern Red Oak, and Red Gum. The strength properties examined were: modulus of rupture in transverse bending, maximum crushing strength in compression parallel to grain, modulus of elasticity in bending, maximum shearing strength parallel to grain, and proportional limit stress in compression perpendicular to grain; also sp. gr. The survey comprises the variability of small clear specimens and that of structural timbers in grade groups. It was found that coefficients of variation ranged from 8 to 15% in sp. gr., 24–39% in compression perpendicular to grain and 14–24% in the other properties examined. *From author's summary.*

1514. KRAEMER, J. H. **The effects of three factors upon the cross-breaking strength and stiffness of Red Pine.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 560, 1951. pp. 20. 18 refs.

Blocks were cut from 217 beams previously subjected to static-bending tests, the rate of growth and specific gravity were determined on each, and alignment of fibrils of the secondary cell walls of longitudinal tracheids was measured. Both rate of growth and alignment of fibrils were found to be strongly correlated with modulus of rupture and modulus of elasticity, but the correlation of specific gravity with these strength properties was negligible.

1515. BROTERO, F. A. Taxas de trabalho admissíveis em estruturas de Pinho Brasileiro. **[Permissible loads in structures of *Araucaria angustifolia*.]** *Bol. Inst. Pesqu. tec. S. Paulo* No. 39, 1951. pp. 32 + 1 tbl. 8 refs. [Fort.]

Presents the results of tests of *Araucaria angustifolia* for impact bending strength, strength in compression parallel and perpendicular to the grain, static bending strength, shear strength, humidity and specific gravity. The experiments suggest that it is possible to estimate most of the permissible loads in wood structures by calculations based on the values for compression parallel to the grain.

1516. ARMBRUSTER, E. Untersuchungen an kunstharzverleimten Lamellen- und Rostträgern, sowie Vergleich mit Vollholzbalken. **[Investigations on laminated and grid girders glued with synthetic resins, and a comparison with solid wooden beams.** *Mitt. öst. Ges. Holzforsch.* 3 (3), 1951 (7–13). 4 refs. [G.g.] P.R.

Tests were carried out on test beams (500 × 50 × 11 or 500 × 30 × 10 cm.) of 3 kinds: ordinary laminated beams, laminated beams for laminated lattice constructions (beams with glued-in lateral projections representing the laminae of transverse beams), and solid wood beams. The material used was 2nd class (sometimes 3rd class) Spruce and Fir in the form of ¾-in. or 1-in. boards, of moisture content *ca.* 15% (artificially dried). The glue consumption was *ca.* 0·25–0·40 kg. glue ('Synolith' cold glue) per sq. m. of the glued joint. The spreaders (up to 40%) did not affect the strength of gluing. The bending tests showed that the lattice-construction beams were not inferior to ordinary laminated beams, but in order to attain the same degree of safety it was necessary to apply to the lattice-construction beams the effective moment of inertia $J_s = 0{\cdot}7\ J_o$. For laminated beams, unlike solid

wooden beams, the modulus of elasticity in compression is greater than the modulus of elasticity in tension. For larger constructional parts the modulus E should be taken as 85,000 kg./sq. cm. (not 100,000 kg./sq. m.). The glued laminated beams showed elastic behaviour on the fringe of breaking stresses. With increase of load, the value of the modulus E fell rapidly for scantlings but not for laminated beams.

1517. KON, T. **On laws of flexural rupture of wood.** *Memoirs of the Faculty of Engineering, Hokkaido University, Sapporo* 8 (2), 1949 (3–28). [Jap. e.] *Brit. Abstr. BI*, Nov. 1950 (960). P.R.

The mechanism of flexural rupture of material of low shearing-strength, and the influence of the load and span/depth ratio on the modulus of rupture, are studied. The limits of span/depth ratio, which determine the (elastic or plastic) distribution of normal stresses and properties of shearing failure, are discussed for some serious loading cases. Finally, common design methods are considered in relation to present theory of the modulus of rupture.

1518. WILCOX, H. **The effects of machine head speed and specimen span on modulus of rupture values obtained in static bending tests of a nominal $\frac{5}{32}$-inch Douglas-Fir hardboard.** *Tappi* 34 (7), 1951 (314–6). 5 refs. P.R.

1519. **Timber mechanics. Studies of mechanical properties and testing methods.** *Rep. For. Prod. Aust. 1949/50*, 1950 (15–6). P.R.

A non-destructive 'impact-hardness' test is being developed in which the hardness of the timber is measured by the reciprocal of the area of the impression made by a falling steel ball. Interim results have shown that the correction procedure for moisture content recommended by the Empire Timber Mechanics Conference is more reliable than that so far used in the laboratory.

1520. ARMSTRONG, F. H. **Abrasion tests of some recently-introduced hardwoods. 4-7. [Resistance to wear as flooring.]** *Wood* 16 (6–9), 1951 (214–5; 258–9; 296–7; 338–9).

[Cf. *For. Abstr.* 13 (Nos. 637, 1602–3).]

(4) Tests made at the Forest Products Research Laboratory, Princes Risborough, demonstrated the very high resistance of Muhuhu (*Brachylaena hutchinsii*) to abrasion, both when rift-sawn and flat-sawn. The wood is highly suitable for heavy-duty flooring.

(5) Musine (*Croton megalocarpum*) has a high resistance to abrasion and can be classed with fine-textured hardwoods of the same order of density. It is suitable for heavy-duty and other flooring and can be used in wood-block or wood-strip form. It can be nailed in the ordinary way without splitting.

(6) Panga-Panga (*Millettia stuhlmanii*) showed high resistance to abrasion. It is considered suitable for decorative and general flooring, and for some heavy-duty types of flooring. It can be used as wood strips and as wood blocks.

(7) Commercial Afzelia (including 5 species of *Afzelia*) showed, when rift-sawn, only a small average % loss in weight through abrasion. It could be used for the general utility type of flooring when smoothness of surface is not important. Flat-sawn stock tends to splinter and disintegrate. Afzelia can be used for wood-block and wood-strip flooring; but for the latter, pre-boring for nails is desirable.

1521. KEYLWERTH, R. Spalten, Spaltbeanspruchung und Querfestigkeit des Holzes. [**Cleavage, splitting stress and transverse strength of wood.**] *Holz Roh- u. Werkstoff* 9 (1), 1951 (1–7). [G.g.] P.R.

A mechanical analysis of phenomena and forces during the cleavage of wood specimens. Investigations on splitting characteristics and splitting resistance have so far revealed only a mutual gradation of the tensile and flexural stresses, which can be due to many factors. The assumption of superimposed and linear tensile and flexural stresses, though bringing one nearer to real conditions, gives, however, results that depend upon the form of specimens. The actual transverse strength and elongation of wood can be evaluated on prism-shaped specimens, and used for construction elements. *From author's summary.*

1522. WOOD, L. W. **Formulas for columns with side loads and eccentricity.** *Rep. U.S. For. Prod. Lab., Madison* No. R1782, 1950. pp. 17 + 2 dgms., 1 gph. 7 refs. P.R.

An amplification and explanation of an article of the same title by J. A. Newlin, published in Building Standards Monthly, December, 1940.

1523. **Timber mechanics. Columns.** *Rep. For. Prod. Aust. 1949/50*, 1950 (17–8). P.R.

Preliminary testing under short-time loading, on a set of model columns of Silver Quandong of various lengths, nominal excentricities and directions of growth rings, showed that the most effective measurements to take were the central deflection and surface strains under successive increments of load.

813. *Wood Chemistry*

See also Nos. 1025, 1478, 1480, 1692, 1701–2.

1524. WACEK, A. Holz und Chemie. [**Wood and chemistry.**] *SchrReihe öst. Ges. Holzforsch.* No. 2, 1950 (153–62). [G.] P.R.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

1525. **Chemical investigation of the cambial and neighbouring zones of *E[ucalyptus] regnans*.** *Rep. For. Prod. Aust. 1949/50*, 1950 (9). P.R.

The acetyl content of heartwood is ca. 9%, that of all zones about 4–6%. Chlorite holocellulose contents varied from 33% in the cambial zone to 84% in the sapwood. The hydrolysates from the sapwood contained much xylose and little glucose; those from the cambial zones little xylose and much glucose. Temperature has been found to be a critical factor in the determination of holocellulose by the chlorite method.

1526. JAYME, G. Über die Bedeutung des Zugholzanteils in Pappelhölzern. [**The significance of tension-wood in Poplar.**] *Holz Roh- u. Werkstoff* 9 (5), 1951 (173–5). [G.g.] P.R.

Presents the results of a chemical investigation of Poplar tension wood compared with those obtained for normal wood. Tension wood contained more raw cellulose (and pure cellulose), but less lignin, less hypothetic total pentosan, and less soluble hemicellulose than normal wood. The specific gravity (oven-dry) of tension wood was 17·5% greater than that for normal wood. No difference in fibre length between the two woods could be found. When peeled, Poplar with a high tension-wood content yields veneer with a 'wavy' surface. *From author's summary.*

1527. LINDTGREN, B. O. **Treatment of Spruce lignin with sulphite solutions at pH 4–9.** *Acta chem. scand.* 5 (4), 1951 (603–15). 18 refs. [E.e.] O.R.S.

Wood powder of *Picea abies* extracted with ethanol/benzene was heated at 135° with sulphite solutions for 1 to 24 hr. at pHs varying from 4 to 9. The powders were then analysed for lignin and S. Results are shown in graphs and tables.

1528. BAILEY, A. **Ultraviolet absorption spectra of chromatographic fractions of lignins.** *J. Amer. chem. Soc.* 73 (5), 1951 (2325–6). 8 refs. O.R.S.

Chromatographic fractions of lignins from *Abies balsamea* and *Picea glauca* were examined. The curves obtained were sufficiently different for each fraction (10 in all) to be identified from its absorption curve.

1529. KUDZIN, S. F., and NORD, F. F. **Investigations on lignin and lignification. IV. Studies on hardwood lignin.** *J. Amer. chem. Soc.* 73 (2), 1951 (690–3). [Department of Organic Chemistry and Enzymology, Fordham University.] O.R.S.

Native lignin was isolated from Oak, Birch and Maple. Chemical analytical and ultraviolet and infra-red absorption data were compared with those from softwood native lignin and were found to be in close agreement. The methoxyl contents of Oak and Birch were 14·8 and 14·9%, suggesting that only guiacyl nuclei were present, but the higher methoxyl content of Maple (17·4%) suggested the presence of syringyl groups. This was confirmed by the Mäule test for distinguishing hardwood and softwood lignins, the Oak and Birch native lignins, like softwood lignins, giving an indefinite yellow colour, while Maple native lignin gave red, the characteristic hardwood reaction. A study of lignin liberated by fungal decay is being undertaken to determine whether the native and residual lignins are identical for the hardwoods studied.

1530. PEPPER, J. M., BROUNSTEIN, C. J., and SHEARER, D. A. **Studies on lignin by means of catalytic hydrogenation of Aspen wood and wheat straw.** *J. Amer. chem. Soc.* 73 (7), 1951 (3316–9). 10 refs. O.R.S.

The ultraviolet absorption spectra of lignin fractions isolated from wheat straw and from Aspen (*Populus tremuloides*) meals were compared and showed only minor differences, all curves being similar to those for other isolated lignins, and basically aromatic. Three lignin degradation products, 4-hydroxy-3-methoxyphenylethane, 4-hydroxy-3,5,-dimethoxyphenylethane, and 2-(4-hydroxy-3,5-dimethoxyphenyl)-ethanol, also obtained from Maple wood [cf. *For. Abstr.* 10 (No. 1117)] were isolated.

1531. DEBAUN, R. M., and NORD, F. F. **Investigations on lignin and lignification. V. Lignin of cork.** *J. Amer. chem. Soc.* 73 (3), 1951 (1358–9). O.R.S.

Native lignin was isolated from the bark of *Quercus suber*. It appeared to be contaminated with other extractable material such as tannin or phlobaphene or both. The lignin content did not rise on successive precipitations, which suggests that pure lignin cannot be obtained from bark by this method.

1532. WARDROP, A. B., and DADSWELL, H. E. **The swelling behaviour of conifer tracheids and the concept of a skin substance.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 4, 1950 (198–226). 47 refs.

The swelling behaviour of tracheids in solutions of cuprammonium hydroxide has been investigated. It has been concluded that the balloon swellings arise from the middle layer of the secondary wall and that the constrictions between these swellings are caused by the outer layer of the secondary wall. The primary wall is removed from the cell in the initial stages of swelling. The concept of a 'skin substance' as proposed by Ludtke is rejected. The cuprammonium - hydroxide - insoluble fraction of pulps, to the carbohydrate portion of which the term 'skin substance' has been applied, has been observed to consist mainly of fragments of the primary wall and of the outer layer of the secondary wall. It is suggested that the carbohydrate part of this fraction represents no constant morphological or chemical fraction of the tracheid and consists of those carbohydrate constituents of the cell wall which are insoluble in cuprammonium hydroxide, together with some carbohydrates present in the cell wall in close association with lignin. The composition of this fraction is likely to be determined largely by the chemical history of the pulp from which it is extracted. *Authors' summary.*

1533. FISCHER, H. O. L., and MACDONALD, D. L. **Carbohydrate chemistry.** *Ann. Rev. Biochem.* 20, 1951 (43–66). 331 refs. O.R.S.

A review of recent literature, mainly of that between October 1949 and October 1950, including some articles on the chemistry of tree species.

1534. LAWTON, E. J., BELLAMY, W. D., HUNGATE, R. E., BRYANT, M. P., and HALL, E. **Some effects of high velocity electrons on wood.** *Science* 113 (2936), 1951 (380–2). 7 refs. [General Electric Research Laboratory, Schenectady, New York.]

Irradiation of Basswood with high-velocity electrons altered its structure in such a way that some of the insoluble carbohydrate components became available to rumen bacteria. Possible interpretations of this result are offered. [Cf. *For. Abstr.* 13 (p. 115).]

1535. POLJAK, A. Holzaufschluss mit Peressigsäure II. Cellulosebestimmung mit Peressigsäure. [**The decomposition of wood with peracetic acid. II. Determination of cellulose with peracetic acid.**] *Holzforschung, Berlin* 5 (2), 1951 (31–3). [G.] P.R.

[Cf. *For. Abstr.* 11 (No. 1349).] Describes a new quick method of using peracetic acid for the determination of cellulose in lignified material. The reaction between wood and peracetic acid comes to an end after 30 min. The cellulose obtained contains no lignin elements. Three components with a chemical coupling ability are found to be present in the native lignin of Fir wood, and only one such component in the case of Beech wood. It is assumed that the phenolic lignin components first pass into solution in their native form as glucosides, while their sugar residues are split hydrolytically when the reducing substances are determined later with a mineral acid. *From author's summary.*

1536. HINTON, C. L. **The polyuronides.** *Ann. Rev. Biochem.* 20, 1951 (67–86). 148 refs. O.R.S.

Reviews the present state of knowledge and includes a table showing the uronic-acid content of polyuronide from different materials, e.g. tree gums, hemicelluloses from hardwoods, Cottonwood and Oak, and wood cellulose.

813.2. Minor Organic Constituents. Extractives

1537. LINDSTEDT, G., and MISIORNY, A. **Constituents of Pine heartwood. XXIV. Investigations on stilbopinin, cryptostrobin, and two new substances, strobobanksin and strobochrysin from the heartwood of *Pinus strobus* L.** *Acta chem. scand.* 5 (1), 1951 (1–12). [E.e.] [Kungl. Tekniska Högskolan, Stockholm.] O.R.S.

1538. LINDSTEDT, G., and MISIORNY, A. **Constituents of Pine heartwood. XXV. Investigation of forty-eight *Pinus* species by paper partition chromatography.** *Acta chem. scand.* 5 (1), 1951 (121–8). [E.e.] O.R.S.

1539. LINDSTEDT, G. **Constituents of Pine heartwood. XXVI. A general discussion.** *Acta chem. scand.* 5 (1), 1951 (129–38). 32 refs. [E.e.] O.R.S.

The investigation of the constituents of Pine heartwood, as presented in previous parts of this series is reviewed and discussed. The following substances are characteristic for the 2 subgenera of the genus *Pinus:* (1) Subgenus *Haploxylon*; Stilbenes and dibenzyls; flavones and flavanones derived from phloroglucinol; and for the group *Strobi*, in addition, flavones and flavanones derived from methylphloroglucinol. (2) Subgenus *Diploxylon:* Stilbenes, but not the corresponding dibenzyls; flavanones, but no flavones. [Cf. *For. Abstr.* 13 (Nos. 643–4).]

1540. BRANDT, C. W., and THOMAS, B. R. **Resins of the *Dacrydium* and *Podocarpus* genera—the wood resin from *Dacrydium cupressinum* (Rimu).** *N.Z. J. Sci. Technol.* 33B (1), 1951 (30–7). 24 refs. P.R.

A brief account is given of the chemistry of the resinous constituents from the woods of a number of species of *Podocarpus* and *Dacrydium.* The neutral portion (0·7% of the dry wood) of the resin extracted from the wood of *D. cupressinum* with alcohol, is shown to contain the diterpenoids totarol, ferruginol, 9-keto-ferruginol (apparently identical with sugiol), the sesquiterpene macrocarpol, a phytosterol (probably sitosterol), and a crystalline wax. A structure for totarol is suggested and discussed briefly, This chemical evidence suggests a close relationship of *D. cupressinum* to *Podocarpus*, and absence of any relationship to *Dacrydium. Authors' summary.*

1541. **[Chemical properties of *Chlorophora excelsa* and *Mora* spp.]** *Col. Res., Lond. 1950/1,* 1951 (41, 45, 53).

Investigations of the phenol present in the wood of *Chlorophora excelsa* have shown that it has only slight fungistatic properties [cf. *For. Abstr.* 12 (No. 1191)]. The saponin present in *Mora excelsa* yields on hydrolysis a mixture of oleoanolic and morolic acids; further experiments have shown that it is not likely to prove of economic value. The saponin present in *M. gonggrijpii* yields oleoanolic acid on hydrolysis.

1542. **Extractives of wood.** *Rep. For. Prod. Aust. 1949/50,* 1950 (10). P.R.

Eucalyptus marginata yields only part of its kino on extraction with organic solvents, the yield increasing as wood is more and more finely comminuted. Various Eucalypt kinos have been successfully resolved into major constituents by means of paper partition chromatography. The elucidation of the constitution of aromadendrin is now complete. A method has been developed which makes it possible to recover more than 80% of the pigment from the CH_3OH extract of *Eucalyptus regnans.*

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

1543. RUNKEL, R. O. H. Zur Kenntnis des thermoplastischen Verhaltens von Holz. [**Thermoplastic behaviour of wood.**] *Holz Roh- u. Werkstoff* 9 (2), 1951 (41–53). 131 refs. [G.g.] P.R.

A survey of world literature on chemical processes in the system wood/water/heat, followed by a discussion of the various transformation possibilities of the hemicelluloses and of the lignin/carbohydrate complex, including the hydrolytic break-up and the subsequent formation of plastic substances by condensation. Suggests a new method for the investigation of chemical processes during plasticizing by heat, which consists in treating the material in a gas-tight apparatus which prevents the volatile products from escaping. The apparatus (a kind of autoclave) should be packed with wood material which is subjected to hydraulic pressure. The generated volatile products fill out the pores (7–20% of the volume), and the conditions of the polymerization and condensation processes resemble those in pressure synthesis.

813.5. Reaction with Metals

See No. 1686.

814. *Natural Durability. Old Wood. Fossilized Wood*

See Nos. 1641, 1686.

815. *Effect of Growth Factors on Structure and Properties*

See also Nos. 1499, 1509, 1512, 1514, 1681.

1544. AMOS, G. L., BISSET, I. J. W., and DADSWELL, H. E. **Wood structure in relation to growth in *Eucalyptus gigantea* Hook. f.** *Aust. J. sci. Res.* 3*B* (4), 1950 (393–413). 7 refs. P.R.

A survey has been made of the structure of the wood of *Eucalyptus gigantea* in relation to growing conditions in the Australian Capital Territory. Using the number of cells cut off by the cambium at various intervals during the growing season as a measure of growth, mathematical expressions have been obtained for growth in young trees at ground level, breast height, and half height; from these, growth-rate curves have been derived. The time of year at which growth commences, the relationship of vessel production to commencement of growth, the formation of late wood, and the period of dormancy, have all been considered in detail. Variations in fibre dimensions have been investigated in relation to growth and it has been shown that in any one growth ring the shortest fibres are found in the early wood and the longest in the late wood. An intrinsic relationship between growth rate and fibre dimensions has been established, and, at the junction between late and early wood, a sudden change in fibre dimensions occurs corresponding to the discontinuity in growth rates. Anomalous woody tissue formed during severe drought conditions is also described. *Authors' summary.*

82. CONVERSION, SHAPING, ASSEMBLY AND FINISHING OF WOOD: GENERAL

1545. HJORTH, H. **Principles of woodworking.** Bruce Publishing Company, Milwaukee. 1950. pp. x + 445. P.R.

Contains sections on the history of woodworking tools, hand tools, machine tools, the sharpening of tools, planing and squaring to dimension, grooved joints, dowel joints, lap joints, mortise-and-tenon joints, mitre joints, dovetail joints, gluing and clamping, metal fastenings, wood turning, surface decoration, upholstery, wood finishing, and wood. There are 800 illustrations.

1546. KIVIMAA, E. **Cutting force in woodworking.** *Julkaisu, Valtion teknillinen Tutkimuslaitos, Helsinki* No. 18, 1950. pp. 102. 11 refs. [E.e.] P.R.

A new mechanical method was developed for determining separately the two components of cutting force: the main cutting force F_1 parallel to the path of the knife, and the thrust force F_2 normal thereto. It was found appropriate to express the cutting force in units kg. (force)/cm. (force kilograms divided by the cutting width). The cutting force can be regarded as composed of: (1) the cutting factor F_c, responsible for 'chip' severance proper, and (2) the deformation factor F_d responsible for the deformations. The value of F_c depends largely on the sharpness of the knife; that of F_d on the rake angle of the knife, being, within certain limits, a fairly linear function of chip thickness. The cutting force was found to remain constant when the cutting speed changed. The cutting direction with reference to the grain was found to be of determinative significance. In general, the cutting force is greatest in the main cutting direction where the cutting surface lies at right angles to the grain. It is appreciably smaller when both the cutting surface and the movement direction of the knife are parallel to the grain; it is least when the cutting surface lies parallel to the grain but the movement direction of the knife is at right angles to the grain. A chip thickness of 0·1 mm. seems to be the optimum value; for lesser thicknesses the chipping work increased abruptly (particularly below 0·05 mm.), while no significant saving of energy can be achieved when the thickness exceeds 0·2 mm. The cutting force was found to vary approximately linearly with the specific gravity of wood (air-dry Finnish Birch). The cuting force rose to a maximum when the moisture content increased up to 10–13%, and fell again with higher moisture content. Comparison of results obtained with 21 species showed that it is possible to estimate the main cutting force of any wood species on the basis of its sp. gr. The rake angle of the knife was found to determine in the main the whole nature of the cutting operation. The thrust component of F_d is positive for rake angles below 10°, and negative for greater angles. *From author's summary.*

1547. HENRIKSEN, E. K. **Stress distribution in the continuous chip—a solution of the paradox of chip curl.** *Trans. Amer. Soc. mech. Engrs.* 73 (4), 1951 (461–6). P.R.

The 'chip' passes along the tool face for a certain distance before it leaves the tool, then curls. It is suggested that a sudden drop in pressure occurs at the point of ultimate contact, which combines with a single force at this point. The physical origin of this system of forces is explained by surface roughness of the tool, which explains the sharp boundary line for the area of wear on the tool face. Distribution of pressure between chip and tool follows an exponential law. Methods of stress analysis are explained that should be useful in further investigations. *From author's summary.*

1548. **Machines and equipment.** *Wood* 16 (7), 1951 (277–9).

Includes descriptions and illustrations of a new American hand power-saw for cross-cutting, ripping or notching, a British heavy plywood press with automatic loading and unloading equipment, and a British swing-hammer shredder for reducing bark, wood waste and other fibrous materials.

1549. Holzbearbeitungsmaschinen 1951. **[Woodworking machines, 1951.]** *Holztechnik* 51 (4), 1951 (98–127, 130). [G.] P.R.

Description of the exhibits of 94 German manufacturers of wood-working machines in the 'Technische Messe' at Hanover, 29 April–8 May 1951. The illustrations and descriptions comprise thicknessing machines for planks, a large drum polishing machine, automatic charging devices for plywood presses, peg-hole boring machines, scraper and milling machines, squaring saws, glue spreaders, hydraulic presses, semi-automatic polishing machines, high-temperature seasoning apparatus,

automatic veneer clippers, band saws, circular saws, an electric moulding machine, and veneer peelers.

1550. SOULILLOU, A. À la Foire de Paris. Nouvelles machines françaises pour la forêt et la scierie. [**The Paris Fair. New French machines for forest and sawmill.**] *Rev. Bois Appl.* 6 (7/8), 1951 (33–5, 46–7). [F.]

Illustrated descriptions of cross-cut saws, a log hoist, frame saws, band saws (mill, workshop, and portable), a lock saw, sharpening machines, and machines for saw maintenance.

1551. SKOGLUND, C. Förslitning av kutterstål. [**Wear of cutting steel.**] *Medd. svenska Träforskn-Inst. (Trätekn. Avd.)*. No. 19*B*, 1951. pp. 13 + 9 photos, 1 dgm., 8 gphs. [Sw.] P.R.

Discusses the results of experiments on the effect of varying the quality and type of the steel, and the speed of feed and of cutting, on the wear caused by cutting hard fibreboard.

1552. GRAHAM, P. H. **Tungsten carbide tool study shows how to get best results.** *Wood-Worker, Indianap.* 70 (2; 3), 1951 (22–3; 38).

Despite the high initial cost and the special experience needed, tungsten-carbide-tipped tools and cutters are finding more and more use, especially in the high-speed production field.

821. *Barking*

1553. JOHNSON, M. **Recent developments in hydraulic barking.** *Paper Tr. J.* 133 (2), 1951 (75–6). P.R.

Appraisal of several types of hydraulic barker introduced a few years ago, e.g. the Hansel Ring Barker, and Simons Rotary Head Barker.

1554. **The Sandy Hill Peppy Peeler.** Northeast Pulpwood Research Center, Gorham, N.H. 1951. pp. 12 + 12 photos, 2 dgms. P.R.

Describes the re-designed Peppy Peeler manufactured by the Sandy Hill Iron & Brass Works, Hudson Falls, N.Y., and intended for use as a portable or semi-portable barker for the pulpwood industry.

822. *Saws and Sawing*

See also Nos. 1253, 1548–50, 1579–81.

1555. WAGNER, P. L., and RULE, J. R. **Circular saw mounting.** *Brit. Patent* No. 651,758, Apr. 11, 1951. pp. 2 + 4 dgms. P.R.

The mounting includes an improved means of adjusting the angle of the circular saw on its spindle for the purpose of cutting grooves of different widths.

1556. SHERLOCK, F. E. **Care of tools for machinists: the circular saw.** *Wood* 16 (8), 1951 (310–4).

1557. CIVIDINI, R. Za natančno razperitev žagnih zob. [**Accurate setting of saw-teeth.**] *Les, Ljubljana* 2 (2), 1950 (30–32). [Sloven.]

823. *Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning*

See also No. 1549.

1558. LINDNER, J. Kehlmesserköpfe mit Rundmessern. [**Moulding cutter heads with circular cutters.**] *Holztechnik* 31 (8), 1951 (220–4). [G]. P.R.

An illustrated description of a cutter head which is the subject of a patent application in Germany. It consists of 2 disks of open-hearth steel, between which 2 or 4 cutters of circular section are mounted. The cutters can be sharpened either individually or in the cutter head as milling cutters are. Cutters of various shapes can be used, e.g. straight, oblique, or spiral cutters, small circular saws, and various combinations. It is claimed that an unchanged profile can be maintained for a given cutting angle, friction on the back of the cutter is obviated owing to the small sharpness angle, the cutting angle can be easily changed (by grinding) and set, and the useful wear of the circular cutters is 2–3 times greater per unit of weight than that of either flat cutters or a milling cutter. The usual dimensions are: cutter width 20–125 mm., disk diameter 125–160 mm.

1559. DOUGLAS, W. **Pros and cons of the oscillating bit mortise.** *Woodwkg. Ind.* 8 (8), 1951 (533–4). P.R.

1560. Une combinée. [**A multi-purpose machine.**] *Rev. Bois Appl.* 6 (7/8), 1951 (49). [F.]

Description of a machine (Combinée C5.206) made by the Outillage Artisanal du Bois and capable of working as a planer, a mortiser, vertical spindle moulder (milling machine), circular saw, and surface planer. Weight 1,200 kg., motor 6 h.p.

824. *Forms of Joint. Jointing and Assembly*

824.1. Nailed Joints

See No. 1600.

824.8. Glues and Gluing

See also Nos. 1548–9, 1589–92, 1631.

1561. BOCK, E. Prüfung von Holzleimen. Die Bestimmung der statischen Festigkeitseigenschaften der Leimverbindungen. [**Testing of wood glues. Determination of the static strength properties of glued joints.**] *Holz Roh- u. Werkstoff* 9 (2), 1951 (62–71). 12 refs. [G.g.] P.R.

Discusses and analyses the effect of the glue line on various static strength properties of wood. A test piece has been developed for accurate measurements of tensile strength along the grain; also a new simple method of determining the splitting strength, which gives also the transverse strength value. Compression across the grain can always be neglected, and that along the grain should be taken into consideration only in exceptional cases. The shearing strength can be estimated only on the basis of careful tests. Other strengths (bending, torsional, and buckling) have no significance for the testing of glues.

1562. KNIGHT, R. A., DOMAN, L. S., and NEWALL, R. J. **Durability tests on plywood adhesives.** *Wood* 16 (6), 1951 (210–3).

An interim report on a 10-year experiment in progress at the Forest Products Research Laboratory, Princes Risborough. A large range of adhesives used in Beech plywood is being tested under 4 types of exposure: (1) stored in a normally heated workshop, (2) exposed to the weather on racks facing south in an open field, (3) stored in an open-sided shed and dipped for a moment in water once a month, and (4) immersed in fresh water in tanks standing in the open air. The results after the first 5 years of exposure are presented.

1563. **Bakelite resins for bonding and impregnating wood.** *Information Sheets, Bakelite Ltd., London* [pp. 7]. P.R.

Contains the following Information Sheets: (P3) Resin R.568 for the impregnation of wood, (P4) Cement G.11116 and Accelerator Q.11117, (P11) Cement G.11091, (P12) Wet Abrasion Process for cold-bonding phenolic and urea plastics, (P14) Cement G 17613, (U.2) Cement G.10897/1, Accelerators Q.10911 and Q.10914 (cold, and hot, urea resin for wood bonding), also Cement G.10959 and Accelerators Q.10911 and Q.10914 for ultra-rapid setting adhesive for separate application, and Cement G.11217 and Accelerator Q.11218 as cold-hardening urea gap-filling adhesive.

1564. DALTON, L. K., FITZGERALD, J. S., TACK, G. W., and TAMBLYN, N. **The development of synthetic resin adhesives for improved wood. I. Aniline-formaldehyde resins in phenolic adhesives. II. Cast phenolic adhesives.** *Aust. J. appl. Sci.* 2 (1), 1951 (145–74). 5 refs. P.R.

I.—The effect of the addition of an aniline-formaldehyde resin to hot-setting phenolic adhesives of the cast and resol types was examined. With improved wood, the joint strength increased for additions to both phenolic resins; with laminated fabric board there was an increase for the cast resin only; with Mountain Ash (*Eucalyptus regnans*), a decrease in strength with the resol. A commercial cool-setting cast phenolic adhesive gave the highest joint strength obtained with improved wood, but the lowest with laminated fabric. Different proportions of aniline-formaldehyde resins added to hot-setting resol adhesives showed greater joint strengths when the higher proportions of formaldehyde examined were used in both resins (F/A, 1·5; F/P 2·0), and when the ratio of aniline resin to phenolic resin was 1 : 4, the lowest tested.

II.—Cool-setting phenol-formaldehyde adhesives of the acid-cured, cast-resin type attacked natural wood, causing severe loss of strength during 6 months' exposure to alternating conditions of heat and humidity. There was no evidence of such damage with improved wood, and with 'Tegowood' it was slight. Of the catalysts used H_2SO_4 caused the most, and hypophosphorous acid the least damage to natural wood. The highest concentration of each catalyst used (3% for toluenesulphonic acid) gave the highest bond strength with improved wood but caused the greatest reduction with Mountain Ash. Substitution of resorcinol for 5% or more of the cast phenolic resin, increased joint strengths with all materials glued, and lessened damage to natural wood by permitting the use of lower concentrations of acid catalyst. Replacement of part of the cast resin by Novolak, decreased joint strengths of improved wood, but even when 70% was replaced, the joint strengths of Mountain Ash and Tegowood were little affected. Several types of commercial adhesives were tested and gave high strengths with all materials, though the two urea-formaldehyde adhesives lost strength in Mountain Ash joints on ageing. *Authors' summaries.*

1565. EICKNER, H. W., and BLOMQUIST, R. F. **Adhesives for bonding wood to metal.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1768, 1951. pp. 15 + 1 photo, 1 dgm. 4 refs. P.R.

Describes some of the types that are available, the conditions of bonding that should be observed with them, and the strength and durability of bonds obtained when these adhesives are properly used. Includes a list of 34 selected (American) articles on wood-to-metal and metal-to-metal bonding.

1566. MABBA, A. A. **Glue line doctor.** *Sth. Lumberm.* 183 (2290), 1951 (46–56).

Discusses some causes of faulty glue-lines and methods of preventing and curing them.

1567. BERGIN, E. G. **Glue joint failures and their causes.** *B.C. Lumberm.* 35 (7), 1951 (70, 98–9). 4 refs.

1568. PETERSON, R. W. **Radio-frequency power requirements for edge-gluing.** *Wood* 16 (9), 1951 (340–4).

Figures obtained from experiments on Yellow Birch, Aspen and Sitka Spruce are considered to give a reasonably accurate basis for calculating power needs in edge-gluing when solid electrodes are used.

1569. **Dielectric heating.** *Rep. For. Prod. Aust. 1949/50*, 1950 (14). P.R.

A pilot-plant test to determine the economic possibilities of using high-frequency dielectric heating for setting glue in the manufacture of fruit cases from narrow boards was highly successful.

1570. SELBO, M. L. **Summary of information on gluing of treated wood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1789, 1950. pp. 12. 4 refs.

Results obtained in various studies are correlated and summarized and an attempt is made to frame recommendations. The following preservatives and fire-retardants are dealt with: coal-tar creosote, copper naphthenate, Wolman salts, Celcure, zinc meta-arsenite, chromated $ZnCl_2$, $(NH_4)H_2BO_4$, $(NH_4)_2HPO_4$, $(NH_4)_2SO_4$, H_3BO_3, $Na_2B_4O_7$, $ZnCl_2$, and mixtures of two or more of these.

825. *Cleaving. Adzing. Mechanical Comminution*

See No. 1548.

826. *Peeling. Slicing. Trimming and Edging of Thin Sheets*

See Nos. 1549, 1586–7.

827. *Bending. Moulding (other than by Cutting)*

1571. FESSEL, F. Probleme beim Holzbiegen. **[Wood-bending problems.]** *Holz Roh- u. Werkstoff* 9 (2), 1951 (56–62). 15 refs. [G.g.] P.R.

Breakage at the time of bending and subsequent breakage of solid Oak bends can be considerably reduced by accurate determination and control of the distribution of moisture and stresses in the raw material. The effects of wood structure and moisture distribution after steaming or boiling have been analysed. By suitable selection of bending radius the amount of breakage during bending was reduced from 2 to 0·2% and subsequent breakage completely eliminated. The fracturing of bends on the concave face cannot be prevented by increasing the end pressure.

829.1. *Finishing*

See also Nos. 1549, 1599.

1572. HEEBINK, B. G. **Moisture-excluding effectiveness of edge seals for aircraft sandwich panels.** *Rep. U.S. For. Prod. Lab., Madison* No. 1822, 1950. pp. 6 + 1 dgm., 2 tbls. P.R.

Gives the results of tests on the moisture- and vapour-excluding effectiveness of several edge treatments under conditions considered typical of severe service. Edges of sandwich panels with aluminium facings can be made practically impervious to free water and to water vapour by using a narrow aluminium edge-strip glued in place at the time of panel fabrication. A coating of white-lead paste paint followed by 2 coats of aluminized varnish provides a good edge seal against water, and a fair seal against water vapour.

1573. OUSBEY, J. H. **The finishing shop. Review of wood finishing processes. No. 1. French polishing.** *Woodwkg. Ind.* 8 (8), 1951 (540, 543). P.R.

1574. **Painting woodwork.** *Building Research Station Digest, Watford* No. 30, 1951. pp. 6. P.R.

A summary of information on the effect of timber properties (cellular or porous structure, resin and oil content, moisture content), of paint (primers, intermediate coatings, and finishing paints), and of the painting process (painting of new woodwork, repainting, and the painting of wood treated with wood preservatives) on successful painting of woodwork.

1575. La peinture des bois. **[The painting of woods.]** *Travaux de Peinture, Paris* 5 (2), 1950 (80–1, 83). [F.] P.R.S.

Discusses the effect of various factors on the paintability of woods, viz. the wood structure, resins and oil content, moisture content, knots and other defects. Describes the selection of woods most suitable for painting (species, quality, density, texture), and gives practical guidance for painting the most difficult woods (dense softwoods).

83. TIMBER MANUFACTURING INDUSTRIES AND PRODUCTS. USES OF WOOD AS SUCH

See also No. 1469.

831. *Fuelwood and Various Types of Rough Timber*

See also Nos. 1638–42, 1653, 1664.

1576. HOLCOMBE, R. A. **The microscopy of plate-cut railroad cross-ties.** *Wood Research, Washington, D.C.* No. 7, 1951 (4–9). P.R.

Cf. *For. Abstr.* 12 (No. 3247).

832. *Mills, Their Functions and Products*

832.1. Sawmills and Planing Mills

See also Nos. 1548–50, 1555–7, 1560, 1609, 1788.

1577. PELLY, R. S. **Costs of logging and sawmilling in West Africa: an analysis of 1950 operations by Forest Industries Branch, Sierra Leone.** *Emp. For. Rev.* 30 (3), 1951 (256–8).

1578. THURMOND, A. K. **Good management: key to sawmilling.** *Sth. Lumberm.* 182 (2282; 2283; 2284; 2285; 2287), 1951 (47; 62–4; 46, 48; 46, 48; 42).

Discusses studies made on equipment and labour needs, production costs and profits, in 58 sawmills using circular saws in the Tennessee valley.

1579. HORDERN, R. H. **Sawmilling practice. [1. The squared log, reduction of waste, and the use of guides.] 2. Reciprocating saws. 3. Bandsaws and maintenance. 4. Large-capacity saws. 5. Saw cutting capacity. 6. Economic conversion. 7. Sawmill layout. 8. The reason why.** *Wood* 16 (1–8), 1951 (31–2; 69–71; 112–4; 148–50; 196–8; 234–6; 274–6; 315–7).

1580. ORLICZ, T. **Log frame capacity.** *C.R. Sci. math. nat. Acad. polon.* 1949 (10), (14–5). [E.] O.R.S.

Capacity is affected by 3 factors: the coefficient of effective output, which changes very little; the estimated area of kerf; and the rate of feed. Three fundamental limitations of feed speed have been distinguished: excessively thick 'chips' coming to each tooth of the saw, causing deformation of the teeth and blade of the saw; too great a bulk of chips coming to each tooth of the saw, and the limited compression of chips in the gaps between the saw teeth; and overloading the machine, when driving power is limited by its nature (generally a belt drive). On the basis of these limitations, 3 formulae (not quoted) have been obtained for feed speed.

1581. AREND, A. G. **Provisions for sawing lumber to accurate thicknesses. Allowance for saw kerf and shrinkage in drying.** *Woodwkg. Ind.* 8 (7), 1951 (463–4). P.R.

1582. MCBRIDE, C. F. **Lumber recovery from second-growth Western Hemlock.** *B.C. Lumberm.* 35 (6), 1951 (63, 140, 142).

A preliminary study was made on 95 logs of 90-year-old trees ranging in length from 14 to 20 ft. and in top diameter from 6 to 21 in. Taper averaged 1 in. in 6·4 ft., and the bd. ft./ cu. ft. ratio 5·7 based on log scale, and 6·3 based on lumber tally. Overrun averaged 13%, varying from 77% for the 6-in. diameter class to 5% for the 21-in. class. The % of clear and of selected common grades increased with increasing diameter from 0 to 22 and from 9 to 55% respectively. The No. 1 and No. 2 Common grades decreased with increasing diameter from 63 to 15, and from 25 to 7% respectively. The value of recovery rose from $75.75 per 1,000 bd. ft. for 6-in. logs to $98.60 for 21-in. logs. Comparison with 27 Douglas Fir logs of the same average diameter, from the same stand, which produced only 1% of clear lumber, confirmed the superior self-pruning of Hemlock in early life.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-wood Assemblies

See also Nos. 1502, 1516, 1548–9, 1561–70, 1572, 1605, 1607–8, 1631, 1644.

1583. MUELLER, L. A. **Western Larch for veneer and plywood production.** *Timberman* 52 (3), 1951 (102, 104).

A short summary of tests made on *Larix occidentalis* at the Forest Products Laboratory, Madison.

1584. **Veneer cutting and drying properties of Pecan.** *Sth. Lumberm.* 183 (2290), 1951 (62, 64).

As a result of tests on 15 logs of *Carya illinoensis* and 6 logs of *C. aquatica*, lathe settings for cutting veneers, and drying schedules for the veneers, are tabulated. High-grade veneer yields were low, but there was an estimated yield of over 80% acceptable box shook.

1585. PECK, E. C., and SELBO, M. L. **Comparison of Redwood and flat-grained Yellow-Poplar for cores in furniture panels.** *Rep. U.S. For. Prod. Lab., Madison* No. 1785, 1950. pp. 10 + 13 photos, 1 dgm., 11 tbls. P.R.

Vertical-grained Redwood compares favourably with flat-grained Yellow Poplar as core material for high-quality furniture panels. Under the conditions tested, panels with vertical-grained Redwood cores remained flatter and developed fewer and smaller face ridges and grooves with changes in moisture content, than panels with flat-grained Redwood or Yellow-Poplar cores. Although panels with flat-grained Yellow-Poplar cores generally cupped more than panels with flat-grained Redwood cores, the development of ridges and grooves was less for the Yellow-Poplar cores. Core strips as wide as 10 in., and including bands of sapwood, had no detrimental effects where vertical-grained Redwood was used. Flat-grained Redwood core strips containing sapwood developed more and larger face grooves and ridges than panels with any of the other types of core. *Authors' summary.*

1586. HYLER, J. E. **Log sizes and lathe sizes.** *Sth. Lumberm.* 183 (2290), 1951 (57–60).

Discusses the most suitable lathe size for peeling logs of different diameters.

1587. NEUSSER, H. Überlegungen zu den Abfällen der Furnierschälerei. [**Veneer-peeling waste.**] *Mitt. öst. Ges. Holzforsch.* 3 (2), 1951 (16–21). [G.] P.R.

According to available data, *ca.* 34·4% by volume of air-dry Beech peeler logs is converted to full-size and small plywood; shrinkage and compression loss is responsible for 19·3%, leaving 46·3% as waste material, viz. 18% large waste (end discs and log cores), and 28·3% from sawdust, small veneer sheets and plate-like pieces. Out of the waste, ca. 13·9% is air-dry, while 32·4% has a moisture content of 40–50%, which must be considerably reduced before use. One of the best methods of using small veneer is by scarf-jointing. It is also possible to use log cores for veneers. Only ca. 30% of Beechwood log cores are free from heart-shakes, and ca. 20–40% have short shakes. It is possible to peel such cores (in half-lengths in a special peeler) from 12 down to 6 cm. diameter. A machine of this kind is made by the German firm Vereinigte Furnier- und Sperrholzfabriken. They may also be sliced in machines, 3 sizes of which are made by German manufacturing firms.

1588. KRPAN, J. Iskoriščenje bukovih trupaca za ljuštenje. [**The utilization of Beech logs for peeling.**] *Šum. List* 75 (3/4), 1951 (121–42). 12 refs. [Croat.croat.e.]

The recovery from Beech peeler logs in the production of plywood in Jugoslavia is *ca.* 40%. The waste is accounted for by: total losses at peeler 29% (varying from 8 to 50% as the log diameter decreases), veneer clipping waste 10%, veneer drying loss 6%, veneer trimming waste 4%, plywood trimming waste (circular saw) 4%, loss due to the sanding (or planing) of plywood faces 5%. The effect on the % of waste of stem curvature, non-circular section, excentricity of log, and knot size is analysed. Out of the 60% total waste, 6% represents drying loss, some 4% is utilized for packing and internal transport, while *ca.* 50% is used as fuel.

1589. BORST, A. H. **Improvements in the manufacture of composite boards.** *Brit. Patent* No. 655,791, Aug. 1, 1951. pp. 4 + 4 dgms. P.R.

A method of manufacturing board or panel-like units, each capable of being bowed or curved in one plane, which consists in building up a laminated structure from boards and thin sheets by laying them alternately and maintaining them as a unitary structure by adhesive applied between the board and sheet surfaces on separate areas, or along lines, with untreated spaces between, and then cutting layers from the built-up structure in a plane at right angles to the plane of the structure, each layer so cut being capable of flexing in the plane of the cuts.

1590. HYLER, J. E. **Hot plate pressing of plywood.** *Sth. Lumberm.* 182 (2274; 2276; 2278; 2280; 2282), 1951 (46–8; 63–4, 66; 51–4; 61–2, 64; 59–62).

1591. **New designs in hydraulic plywood presses. Automatic loading and unloading devices for 1,320 and 680-ton models.** *Woodwkg. Ind.* 8 (7), 1951 (478–9). P.R.

Describes a 680-ton multi-daylight hot-plate plywood and veneer press built by the Loewy Engineering Co., Ltd., at the Yeovil works, and the loading and unloading devices to be used with 1,320 and 680-ton presses. A press thus equipped forms a complete self-contained unit, with provision for full automatic, semi-automatic or hand loading.

1592. HYLER, J. E. **Scarf joining for large sheets now is standard.** *Veneers & Plyw.* 45 (7), 1951 (26–8). P.R.

The principles and technique of making scarf joints are described.

1593. **Plywood storage methods.** *Veneers & Plyw.* 45 (7), 1951 (20). P.R.

Describes a 5 × 12-ft. multiple-compartment rack in which plywood panels are systematically stored, all kinds, sizes and thicknesses being segregated.

1594. **Draft revision of Australian Standard Specification for plywood for general purposes**

(A.S. No. 0.6–1938). *Document, Standards Association of Australia, Sydney* No. 172, 1951. pp. 11. D.S.I.R.

1595. **Specification No. 502 for three-ply and multiply constructional and decorative boards.** British Railways, London. 1950. pp. 7. P.R.

1596. **Specification No. 508 for three-ply and five-ply blockboard and sawn kerfed boards, plain and decorative.** British Railways, London. 1951. pp. 6 + 6 dgms. P.R.

833. *Timber in Buildings and Engineering Structures (Manufacture and Use)*

1597. **The Building Research Station, its history, organization and work.** H.M. Stationery Office, London. 1951. pp. 16. P.R.

1598. HARTL, F. Ingenieurholzbau in Österreich. **[Technically sound timber construction in Austria.]** *SchrReihe öst. Ges. Holzforsch.* No. 2, 1950 (75–93). [G.] P.R.

833.1. Building Components and Fittings: General

See also Nos. 1516, 1520, 1646–7.

1599. REID, J. S. **Insignis Pine, its use as a building timber.** *Inform. Ser. N.Z. For. Serv.* No. 9, 1950. pp. 22.

A brief account of the suitability of *Pinus radiata* for building construction. Contains a table of strength properties, describes the sawmill and yard technique, the grades of timber, decay hazard, preservative treatment, and finishing. The appendix deals with grading rules and working stresses.

1600. SIIMES, F. E., and JOHANSSON, P. E. Naulattuihin palkkeihin käytetyn sahatavaran laadun vaikutuksesta palkkien lujuusominaisuuksiin. **[On the influence of the quality of sawn timber on the strength properties of nailed I-beams.]** *Julkaisu, Valtion teknillinen Tutkimuslaitos, Helsinki* No. 67, 1950. pp. 20. [Finn.e.] P.R.

Presents results from 15 small and 7 large test beams made of various kinds of wood (green, seasoned, weak, strong). The tests form part of an investigation to find such uses for structural deals and battens as would best correspond with their properties and grade. *From authors' summary.*

1601. **Swedish flush doors.** *Timb. Tr. J.* 198 (3912), 1951 (1403–4).

Discusses the grading standards for export, and minimum requirements for quality and construction.

1602. VIDEAU, G. Le bois de pin et son utilisation pour la fabrication des parquets. **[*Pinus pinaster* wood and its use for flooring.]** *Bois & Résin.* 33 (1566), 1951 (1). [F.]

Gives some account of the production of floor blocks, and summarizes the standard specification.

1603. BESSEY, G. E. **Floor finishes for industrial buildings.** *National Building Studies Special Report* No. 11, 1951. pp. 28 + 2 tbls. 21 refs. H.M. Stationery Office, London. [Building Research Station, Watford.] P.R.

Describes (pp. 9–10) the general advantages and disadvantages of timber flooring for industrial buildings. Parquet and plywood are unsuitable. For very severe abrasive wear only the following species are suitable: Rock (Canadian) Maple, Pyinkado, Rhodesian Teak, Greenheart, and East African Olive, and in some instances end-grain blocks of softwood. For less severe but still heavy wear, the following are suitable: European Birch, Canadian Birch, Gurjun, Jarrah, Merbau, Mora, European or Japanese Oak, Opepi, and Tallow Wood. [Cf. *For. Abstr.* 13 (No. 1520).]

834. *Shingles. Cooperage. Packing Containers*

See also No. 1569.

1604. SCOTT, M. H. **An unusually severe test for locally produced wooden shingles.** *J. S. Afr. For. Ass.* No. 20, 1951 (78–80 + 7 photos). [E.]

An exceptionally severe hail storm at Pretoria completely destroyed tiled, badly damaged corrugated iron, and holed asbestos roofing at the Forest Products Institute. Experimental roofs of shingles from locally grown *Cupressus lusitanica*, *Pinus patula* and *P. radiata* suffered only minor damage, and there were no leaks in the 1,500 sq. ft. covered by the 17-year-old Cypress shingles. The Pine shingles, which contain compression wood and other defects, tend to curl up and lift on excessively hot, dry days, but after rain they lie almost perfectly flat again.

1605. HYLER, J. E. **Methods used on veneer packages.** *Sth. Lumberm.* 182 (2284), 1951 (51, 54, 56, 58).

Discusses methods and machinery used in manufacturing packing containers (e.g. baskets, crates and barrels) from single-thickness veneer and from plywood.

1606. MESQUITA, G. SEIXAS DE. Contribuição para o estudo da possibilidade de confecção de caixas para embalagens com madeiras obtidas na Colónia. **[Possibilities of manufacturing packing cases from timbers obtained within the colony.]** *Agron. angol.* No. 4, 1950 (141–57). [Port.port.f.e.]

Two solutions are suggested to this problem in Angola: (1) The use of existing material. Suitable species are suggested, and some of their physical and mechanical properties given. (2) The creation of stands of *Grevillea robusta* to provide timber for this purpose. The possible yield from stands managed on a 15-year rotation and the cost of their creation are calculated from data on 3 small stands in the colony.

835. *Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Uses etc.*

See also No. 1670.

1607. BOOTH, H. E., and HUMPHREYS, F. R. **Notes on ski making.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 4 (Spec. issue), 1950 (14–8); 5 (1), 1951 (16–9).

Describes the manufacture of solid and laminated skis, and lists some suitable Australian species. [Cf. *For. Abstr.* 10 (No. 1323).]

836. *Furniture and Cabinet-making. Carving. Marquetry. Wooden Ornaments*

See Nos. 1502, 1585, 1671.

838. *Vehicles (including Ships, Boats and Aircraft)*

See also Nos. 1572, 1644.

1608. NARAYANAMURTI, D., *et al.* **Weathering trials on [wooden] aircraft wings [in India].** *Indian For.* 77 (4; 5; 6), 1951 (247–66; 296–312; 393–400 + 27 photos).

839.8. *Industrial Waste Wood and its Uses*

See also Nos. 1150, 1587–8, 1703, 1705–9.

1609. JUŠTŠUK, E. Avfallsmängder inom sågverksindustrien. **[Amount of waste woods in the sawmilling industry.]** *Medd. svenska Träforskn-Inst. (Trätekn. Avd.).* No. 20*B*, 1951. pp. 11 + 2 photos, 1 dgm., 1 gph., 7 tbls., 1 map. 18 refs. [Sw.sw.] P.R.

Gives figures for the wood waste available from sawmills of different capacity in different parts of Sweden, and discusses its present and potential uses.

1610. METEER, J. W. **Wood waste in Ohio.** *Res. Bull. Ohio agric. Exp. Sta.* No. 698, 1951. pp. 29. 12 refs.

Discusses, with 8 histograms, the amount, classes, distribution, availability, and use and value of wood waste in Ohio.

1611. GARLAND, H. **Possibilities for the production of wood briquette stoker fuel in Northern Michigan.** Forest Products Research Division, Michigan College of Mining and Technology, Houghton, Mich. 1950. pp. 22. P.R.

Waste wood of Northern Michigan species can be briquetted by the Pres-to-log process, the technological and economic aspects of which are discussed.

1612. **Waste wood burning on a Lancashire boiler plant.** *Steam Engineer, London* 20 (234), 1951 (209–14). D.S.I.R.

Describes the boiler installation at The New Insulation Co., Ltd., Gloucester, where mechanical handling of wood chips is employed in conjunction with a mechanical wood-burning stoker. The furnace heats a 30 by 8 ft. 6 in. Lancashire boiler, and consumes 75–90 tons of wood waste each month.

1613. WEIGEL, A. S. **Developments in spreader-firing wet wood.** *Trans. Amer. Soc. mech. Engrs.* 73 (6), 1951 (845–8). P.R.

Describes some spreader-type stokers which can be adapted to existing boilers, for burning wood with a moisture content of up to 60%, and discusses some problems involved.

1614. WRIGHT, G. W. **The disposal and/or utilisation of waste wood.** *Aust. Timb. J.* 17 (5), 1951 (322–342).

Describes the McGashney incinerator, which provides for complete combustion of sawdust, and gives details of the manufacture of boards from wood waste by the dry process, with information on equipment, power and labour requirements, and costs.

84. PRESERVATION AND OTHER TREATMENTS TO IMPROVE THE PROPERTIES OF WOOD. DAMAGE BY BIOLOGICAL AGENCIES AND ITS CONTROL. SEASONING. TIMBERYARD PRACTICE

1615. Verzeichnis der wissenschaftlichen Veröffentlichungen über 'Holzschutz und Werkstoff-Biologie' aus dem Material-Prüfungsamt Berlin-Dahlem (1936–1949). **[List of scientific publications on the subject of 'Wood preservation and biological injuries to materials' from the Material-Prüfungsamt Berlin-Dahlem (1936-1949).]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (130–2). [G.] P.R.

Contains 97 references + 16 typed references dated 1950.

841. *Wood Preservation*

See also Nos. 1570, 1599, 1645, 1662–3, 1686, 1697–8.

1616. SMITH, J. H., and CARR, D. R. **Principles of wood preservation. Their application under New Zealand conditions.** *Inform. Ser. N.Z. For. Serv.* No. 10, 1950. pp. 52 + 4 photos, 2 gphs.

1617. SCHULZE, B., and STAMER, J. Einwirkung von Holzschutzmitteln auf die Holzfaser. **[Effect of wood preservatives on wood fibre.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (113–23). 11 refs. [G.g.] P.R.

Compressive-strength tests were made on Beech-wood test blocks, untreated or treated with one of 122 various preservatives or concentrations of a preservative, over periods in most cases up to 24 months. After 18 months, 9 preservatives were found to have lowered, and 12 to have increased the strength. $ZnCl_2$ (5%) gave after 60 months a strength decrease of *ca.* 30% (the accepted scattering being 20%). Contrary to current belief, the ammonia-containing Cu and Zn solutions, or mixtures of $ZnCl_2$ with NaOH had hardly any weakening effect. Silicofluorides cause an increase of strength. No increase appeared to be due to the effect of oil treatment.

1618. THEDEN, G. Über die Prüfung von 'Sperrstoffen' für den Holzschutz. **[Testing of 'sealing substances' for wood preservation.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (103–9). 1 ref. [G.g.] P.R.

Describes the principles of laboratory tests on 'sealing substances' (substances that reduce the leaching of wood preservatives from wood), and evaluates some experimental results obtained with 5 such substances [the composition of which is not given]. The numerical values obtained do not adequately define the sealing ability of the substances, and only general conclusions could be drawn. *From author's summary.*

1619. SCHULZE, B., and THEDEN, G. Über das Eindringvermögen von Holschutzmitteln und

dessen Prüfung. II. Ausarbeitung von Verfahren für die Bestimmung des Eindringvermögens von Schutz- oder Schädlingsbekämpfungsmitteln in Holz. [**The penetration of wood preservatives and methods of testing it. II. Elaboration of methods for the determination of penetration of preservatives and pest control substances into wood.**] *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (84–103). 26 refs. [G.g.] P.R.

[Cf. *For. Abstr.* 10 (No. 1266).] Describes 7 different methods of testing: (1) rise of the preservative liquid in filter paper or a wood rod, one end of which is immersed in the liquid; (2) the time required for the liquid to pass, under slight pressure, through wood, and the amount of liquid absorbed; (3) the absorption of a drop of the liquid by wood; (4) the depth of penetration of the preservative applied by brushing; (5) amount absorbed and penetration depth in wood blocks following a 10-min. dip; (6) as (5) but carried out with wood cylinders with covered ends and for a longer period; (7) penetration of liquids or pastes into log discs from their periphery. Method (4) is the subject of a German standard; (6) should be used in conjunction with open-tank processes.

1620. SANDERMANN, W., SCHÄRFE, E., and FROEDE, O. Über die Eindringtiefe des Sublimats bei einfacher und verbesserter Kyanisierung. [**The depth of penetration of mercuric chloride in simple, and improved, Kyanization.**] *Holz Roh- u. Werkstoff* 9 (5), 1951 (186–90). 24 refs. [G.g.] P.R.

A new colorimetric determination of mercury shows that the true depth of penetration of $HgCl_2$ in Spruce wood is some 15 mm. greater than that determined by the usual $(NH_4)_2S$ (blackening) method. The greater part of the $HgCl_2$ becomes fixed on the fibres within a few hours after impregnation. Open-tank Kyanization with 0·66% $HgCl_2$ plus 6·6% NaCl increases the depth of penetration 4–5 times. A 12-cm.-thick Spruce pole was almost wholly impregnated by dipping in 0·66% $HgCl_2$ after preliminary steaming at 100–120° C. *From authors' summary.*

1621. FINHOLT, R. W. **Improved toximetric agar-dish test for evaluation of wood preservatives.** *Analyt. Chem.* 23 (7), 1951 (1038–9). 9 refs. P.R.

Fungitoxic materials can be evaluated as wood preservatives by mixing the toxic substances with a malt-extract/agar solution and then testing the mix against standard fungi. The mixing can be done effectively using a Waring Blendor, and the effectiveness of the preservatives is judged by finding the least concentration needed to prevent growth on the gel surface. This method is effective with oil-soluble preservatives which are ordinarily difficult to test in agar solutions, and check results can usually be obtained to ± 5%. *Author's summary.*

1622. HOF, T. Het laboratoriumonderzoek naar de beschermende werking van houtconserveringsmiddelen t.o.v. de aantasting door schimmels. [**Laboratory research on the protective effect of wood preservatives against fungus attack.**] *Circ. centr. Inst. MaterOnderzoek Afd. Hout.* No. 13, 1950. pp. 17. 42 refs. [Du.e.] P.R.

Past and present methods of testing preservatives are discussed, and the method used at the Centraal Instituut voor Materiaal Onderzoek is described, This differs very little from the standard international, German and British methods, except that 1% peptone is added to the malt agar when water-soluble preservatives against *Coniophora cerebella* are tested; this reduces the testing period from 6 weeks to three. To test the resistance of preservatives to leaching and evaporation the blocks are placed in running tap-water for 4 days and allowed to dry for 3 days at 30 or 50°; this treatment is repeated thrice.

1623. EECKHOUT, L. E. Het onderzoek naar de bederfwerende kracht van pentachlorophenol en van kopernaphtenaat op hout. [**Research on the preservative effect of pentachlorophenol and copper naphthenate on wood.**] *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 15 (3), 1950 (690–718). 27 refs. [Flem.flem.f.e.g.]

Tests were made on wood blocks of *Fagus sylvatica*, *Populus* sp. and *Pinus* sp. of the preservative effect of 2 commercial pentachlorophenol preparations, pentachlorophenol in gas oil, cuprinol, DDT, Lasolineum anticid (Muttenz-Bâle) and a nitrophenol, Metzger salt, against different test fungi. Results are tabulated and show that the pentachlorophenol preparations, Cuprinol and Lasolineum, have a good preservative effect, that DDT is of uncertain value, and that Metzger salt is a strong fungicide but is easily leached and is suitable for use only in dry conditions. The great disadvantage of the wood-block method is the difficulty of estimating the proportion of preservative in the weight of the blocks at the end of the test, when semi-volatile preparations are used. *Coniophora cerebella* is the fungus most suitable for general use, as it attacks hardwoods and softwoods equally and shows no particular susceptibility or resistance to the different salts. A leaching process for use before exposure to the fungi is described. [Cf. *For. Abstr.* 12 (No. 2181).]

1624. HARROW, K. M. **Note on the soil moisture content used with the Leutritz technique for testing toxicity of wood preservatives against fungi.** *N.Z. J. Sci. Technol.* 32*B* (4), 1951 (39–40). 2 refs. P.R.

1625. BECKER, G., and SCHULZE, B. Laboratoriumsprüfung von Holzschutzmitteln gegen Meerwasser-Schädlinge. [**Laboratory testing of wood preservatives protecting against sea-water pests.**] *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (76–83). 18 refs. [G.g.] P.R.

Describes the breeding of experimental animals, especially *Limnoria lignorum*, chosen for their easy breeding and lower sensitivity to preservatives compared with *Teredo* or *Chelura*. The tests were carried out with 5 × 2·5 × 1·5 cm. wood blocks. After storage at 20° C. and 65% relative humidity, the blocks were impregnated under reduced pressure with various concentrations of preservatives, and then, in the case of oily preservatives, stored for another 4 weeks at 20° C. and 65% humidity. There followed immersion in distilled water (8 weeks, renewed twice daily, with intermittent air-drying,

and then immersion for 4 weeks in sea water (3·5% salt content, pH 7·5–8). The first tests were carried out with *Limnoria lignorum* and coal-tar oil. Oil fractions up to b.p. 240° C. were ineffective. Among higher-boiling fractions those between 280 and 300° were most, and those between 300 and 330° C. least effective.

1626. NARAYANAMURTI, D., RANGANATHAN, V., SINGH, R., CHANDRASEKHAR, T. R., and BANERJEE, A. **Studies on coal tar creosote as a wood preservative. Part II. First interim report on creosotes of Indian origin.** *Indian For. Bull.* No. 144, 1948. pp. 43 + 198 dgms.

Review of literature and the results of work done at Dehra Dun on toxicity of various fractions, surface tension and swelling, various physical properties of creosote, and accelerated service tests. Sal sapwood and half-round sleepers treated with creosote/fuel-oil mixture gave satisfactory results.

1627. MARSDEN, D. H. **Studies of *Hormodendrum resinae* Lindau, a common inhabitant of creosoted and coal-tar-treated wood.** *Abstr.* in *Phytopathology* 41 (7), 1951 (658–9).

Two distinct morphologic forms of *H. resinae* have been isolated from creosoted telephone poles. One (New York isolate) is brown-spored, while the other (Enola isolate) has spores that are olive-grey in the mass. Each of these isolates has saltated in culture. Certain physiological studies of the Enola isolate are summarized: on nutrient agar containing creosote, the growth rate of the fungus is reduced sharply by concentrations of creosote up to 2%. With greater concentrations up to 8%, the growth rate is nearly constant. That fraction of creosote which distils between 270° and 315° C. is more inhibitory than other distillate fractions and whole creosote. It appears that *H. resinae* can utilize coal tar and creosote as a source of N, the former more readily than the latter. With coal tar as the source of N, increasing amounts of tar up to at least 5% by volume in the medium are reflected in a more nearly normal type of growth and sporulation. Some growth occurs with coal tar as the sole source of C, none with creosote. This apparent ability to metabolize these products suggests that over long periods of time the fungus may degrade their preservative values.

1628. SCHULZE, B., and THEDEN, G. Versuche mit einigen Schutzstoffen gegen das Verblauen von Werkholz. **[Tests on some preservatives protecting against blue-stain in timber.]** *Holz Roh- u. Werkstoff* 9 (2), 1951 (53–5). [G.g.] P.R.

Presents results of tests on 20 × 10 × 1 cm. boards made from selected Pine sapwood and subjected to the action of *Ceratostomella* spores after preliminary brush treatment with various preservatives (fluorine compounds, chlorophenols, chlorocresols, and proprietary preservatives). Best results were obtained with fluorine preservatives (fluorides and silicofluorides).

1629. HARROW, K. M. **Toxicity of water-soluble wood-preservatives to wood-destroying fungi.** *N.Z. J. Sci. Technol.* 31*B* (5), 1950 (14–9). 8 refs. P.R.

The toxicity of 4 water-soluble preservatives to wood-destroying fungi was tested by the wood/soil contact culture method. Tests were made with *Pinus radiata* blocks using the fungi: *Coniophora cerebella* (2 cultures), *Lenzites trabea*, and *Poria vaporaria*. The results indicate that, with the fungi and the culture technique used, the toxic loading (% dry salt in oven-dry wood) of boric acid is between 0·5 and 0·9%, of NaF ca. 1·04%, of Tanalith more than 0·52%, and of $ZnCl_2$ ca. 2·16%.

1630. SCHULZE, B. Neue Erkenntnisse und Verfahren in der Holzschutztechnik unter besonderer Berücksichtigung der Hydrogenfluoride. **[New facts and methods in wood preservation practice with special reference to bifluorides.]** *Holzforschung, Berlin* 5 (2), 1951 (25–31). 6 refs. [G.] P.R.

Gives the results of tests and trials over a period of several years on a new preservative 'WBUS' which is said to combine an extraordinarily low leachability with the advantages common to the well tried bifluoride mixtures. It is said to be particularly useful for the preservation (against insects and fungi) of the highly exposed (under-water or underground) portions of isolated timber structures, and of wood on the external walls of houses, as well as for the preservation and after-treatment of wooden poles. The depth of penetration of the preservative into Pine wood is plotted against time for 3 moisture contents, and for both fixed and leachable portions of the preservative. A table contains data relating to the permanent effect of another preservative (WB_4) against *Hylotrupes bajulus* and *Anobium punctatum* larvae. Results are given of penetration tests of 5 preservatives of the bifluoride type applied by the diffusion impregnation method to Spruce logs of 57% average moisture content; also some data on the use of $HgCl_2$ as a preservative. Finally, the question of the control of *Merulius lacrymans* in brick walls is discussed.

1631. **Lyctus investigations.** *Rep. For. Prod. Aust. 1949/50*, 1950 (23–4).

It has been found that the momentary dip treatment of green veneer in cold solutions of H_3BO_3 or borax is entirely successful in practice for the prevention of Lyctus attack. The addition of preservatives to the glue is recommended for plywood, which will thus be effectively sealed on all surfaces.

1632. MCMULLEN, M. J. **Project No. P.8. Determination of boric acid. Sub-project P8–5. Development of a simple method of estimating boric acid in treated timber. Progress report No. 3.** For. Comm. N.S.W. 1951. pp. 4 + 5 tbls. 1 ref. P.R.

1633. MCMULLEN, M. J. **Project No. P.8. Determination of boric acid. Sub-project P8–4. Development of a method of ashing timber samples without the use of lime-Eschka. Working plan and final report.** For. Comm. N.S.W. 1951. pp. 8. 4 refs. P.R.

1634. BRUNN, G. **Boric acid timber treatment is introduced to New Zealand.** *Aust. Timb. J.* 17 (3), 1951 (207–8).

Discusses the use of boric-acid treatment to reduce the susceptibility to borer attack of *Beilschmiedia*

tawa, increasingly used for flooring and other domestic fitments.

1635. HARROW, K. M. **Impregnation of Tawa (*Beilschmiedia tawa* Benth. and Hook. f.) with boric acid by diffusion. I. Changes in distribution of boric acid with time after treatment. II. Effects of some variables upon loading and distribution of boric acid in this timber.** *N.Z. J. Sci. Technol.* 32*B* (4), 1951 (28–38). 4 refs. P.R.

Presents the results of tests on the ratio of core loading to board loading in green wood treated by hot diffusion, and on the effect of temperature, concentration, and time of treatment, and of the moisture content, sp. gr., and angle of grain upon loading and distribution ratio of H_3BO_3 in 1-in. green Tawa.

1636. HARROW, K. M. **Preservative treatment of Tawa (*Beilschmiedia tawa* Benth. and Hook. f.) by pressure impregnation.** *N.Z. J. Sci. Technol.* 32*B* (5), 1951 (44–8). 7 refs. P.R.

Results of experimental treatments of Tawa by pressure impregnation are presented. At 65° C., and with final solution pressure of 200 lb./sq. in., net absorption, expressed as a % of oven-dry wood weight, ranged from 79·8 after an initial vacuum of 20 in. of Hg to 49·1% after treatment under air pressure of 20 lb./sq. in. A safety factor was computed from the loading data to account for the variation in salt loading between the boards, and the distribution of salt within boards. *From author's summary.*

1637. HARROW, K. M. **Preservative treatment of *Pinus radiata* D. Don by pressure impregnation with cold aqueous solutions.** *N.Z. J. Sci. Technol.* 32*B* (5), 1951 (8–15). 2 refs. P.R.

Pinus radiata can be speedily impregnated with cold aqueous solutions. Complete penetration of all timber can be attained by a gross absorption of 80% of voids in Pine. This can be accomplished by application of selected solution pressures which vary with the initial air pressure used. Penetration is accelerated by higher solution pressures. At least 150 lb./sq. in. with initial air at atmospheric pressure, and 200 lb./sq. in. with 10 lb. initial pressure, is required for impregnation in less than 1 hr. Kickback increases with initial air pressure up to 10 lb./sq. in.; higher initial air pressures do not increase kickback. There is no advantage in using initial vacuum, as it involves an extra operation and timber so treated requires much drying. Atmospheric pressure appears to be the most suitable initial air pressure for *P. radiata*. Even with complete penetration, the core loading may be only ½ as great as the average loading of treated Pine. *Author's summary.*

1638. BAVENDAMM, W. **Schutz von Mastenholz durch Tiefimprägnierung an Ort und Stelle. [Protection of pole timber by deep impregnation *in situ*.]** *Elektrizitätswirtschaft, Göttingen* 49 (2), 1950 (70–3). 10 refs. [G.] L.E.E.

Review of modern methods of preserving poles, special attention being paid to the 'DD' [Dölger-Diffusionsalz?] osmosis method using the well known 'fluor-dinitro-chrome' mixtures with or without As. The necessity for after-care of pole timber (dressings, painting, sheathing with bituminized paper, etc.) is stressed.

1639. RENNERFELT, E., and STARKENBERG, B. **Träskyddskommitténs fält- och rötkammarförsök: redogörelse nr. II. [The wood-preservation committee's field and decay chamber experiments: report No. II.]** *Medd. SkogsforsknInst., Stockh.* 40 (4), 1951. pp. 13. 3 refs. [Sw.e.] Price *Kr.*1.

A further report, after 7 years, on tests established in 1943 [cf. *For. Abstr.* 12 (No. 3201)]. All untreated stakes have now been removed from the plots. Stakes treated with Tanalith U (Basilit UA) are the most severely decayed, followed in order by those treated with Boliden salt and creosote. Poles treated with Tanalith U are all partly decayed, most of those treated with Boliden salts are in good condition, and those treated with creosote are not attacked. In the mine test, all treated stakes and poles are still in good condition; most of the untreated poles and all the untreated stakes were severely decayed and have been removed. In the greenhouse test, the untreated stakes decayed about twice as quickly as the stakes in field plots; all treated stakes have also been destroyed by decay. Larger-scale greenhouse experiments have been started. In a field test established in 1940 on stakes sawn from the inner part of the sapwood of telegraph poles, the average life of untreated stakes was 3·3 years; stakes treated with Tanalith U, Boliden salt, and creosote, are now all more or less severely decayed, while those treated by the Boucherie process with $CuSO_4$ are intact.

1640. NEUBAUER, L. W. **Treated wood stakes—exposed Douglas Fir and Eucalyptus stakes require treatment for long life.** *California Agriculture, Berkeley* 3 (7), 1949 (10, 14). L.S.

Applications of 7 different oils and chemicals by simple and convenient methods were tested on Redwood, Douglas Fir and Eucalyptus stakes. Over a period of 12 years a certain decrease in strength was apparent in all cases, but was slight in Redwood, because of its natural decay resistance. Effects of different treatments on Douglas Fir and Eucalyptus varied. The creosote and Columbia bath treatments were the most satisfactory. Of the methods of application, pressure treatment was the most effective, and next the hot-and-cold bath and the hot-bath treatments.

1641. **Practical methods of increasing the utility and service life of wood.** *Carib. For.* 12 (1), 1951 (15–6, 33–4). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 11 [1950?].)

Casuarina equisetifolia posts treated at the Tropical Forest Experiment Station with carbolineum by the hot-and-cold bath process have lasted for at least 6 years. Good penetration of *Eucalyptus robusta*, *E. resinifera* and *Micropholis chrysophylloides* was also obtained by the same process. A study of untreated fence posts of 32 species showed that the following species were the most durable: *Tetrazygia eleagnoides*, *Citharexylum fruticosum*, *Chrysophyllum pauciflorum*, *C. oliviforme*, and *Phyllanthus nobilis*.

1642. GREAVES, C. **Preservative treatment of Douglas Fir and Western Hemlock sleepers in Canada.** *B.C. Lumberm.* 35 (7), 1951 (81–3). 6 refs.

Paper prepared for presentation at the First Annual Convention of the British Wood Preserving Association, June 1951, discussing methods and equipment and giving some service data for Douglas-Fir sleepers in Great Britain.

842. *Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire*

See also Nos. 1563–4.

1643. BALZER, I. O pokusnim presanjima drveta. **[Experimental compression of wood.]** *Šum. List* 74 (12), 1950 (469–80). 8 refs. [Croat.croat.]

Some physical and mechanical properties of 'Lignostone' (compressed wood) specimens prepared by experimental compression of Beech wood were determined and compared with those of German Lignostone and of uncompressed Beech wood. It was found that heat treatment (up to 220° C.) is not essential; cold-pressed specimens had good mechanical and physical properties. Industrial-scale pressing can be effected either in multi-daylight presses, steam- or electrically-heated up to 120° C. or in single-daylight presses. It was found that best-quality 'Lignostone' was obtained from battens cut strictly along the radial plane; rupture of fibres was found to occur during pressing in specimens cut skew. X-rays disclosed the change in density due to compression, enabling the author to estimate the density of the product. This 'semi-microradiographic' method is described in some detail, and its important uses are stressed. It was shown that the increase of density during compression is a function of both pressure and the maximum density of the cell substance, the relationship being expressed by means of a differential equation analogous to that used in chemical kinetics for unimolecular reactions.

1644. DIXMIER, G., and IABLOKOFF, A. Les bois imprégnés. **[Impregnated timbers.]** Association Technique Maritime et Aéronautique, Paris. 1950. pp. 14. 10 refs. [F.f.] P.R.

Investigations carried out at the Office National d'Études et de Recherches Aéronautiques have shown that: (1) it is possible to make from French-grown Spruce aeroplane plywood with outstanding mechanical properties; (2) delignification of wood opens new possibilities for its improvement and for the use of impregnated wood; (3) impregnation by osmotic diffusion is particularly suitable if it is desired to increase compressive strength without unduly increasing density; and (4) the graphs obtained of the absorption and 'desorption' isotherms of water vapour give some insight into the degree of penetration of resins into wood. *From authors' summary.*

843. *Fireproofing and Fire Resistance*

1645. SEEKAMP, H. Die Beeinflussung der Brennbarkeit des Holzes durch Holzschutzmittel. **[The effect of preservatives on the combustibility of wood.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten, Berlin* 2 (7), 1950 (109–12). 7 refs. [G.] P.R.

Criticism of E. Motzkus's [*ibid.*, 1 (5), 1940 (53)] method of determining the degree of combustibility of various wood specimens. A new method is suggested for evaluating the numerical results obtained by the 'fire-tube' method of Hunt, Truax and Harrison. This is based on statistical considerations, and a formula is derived for evaluating the fire-retarding properties of a preservative:

$$G = 2{\cdot}73\,\frac{M_o - M_b}{\sqrt{\Sigma\delta_o^2 + \Sigma\delta_b^2}}$$

where M_o and M_b are the mean values of weight losses for the untreated and treated test rods, and δ_o and δ_b are the individual deviations from the mean in the first and second series, the number of results in each series amounting to 10. The G values obtained for several preservatives tested with Alder specimens, are as follows:—

NaF 0, zinc silicofluoride 0, magnesium silicofluoride 0, I_1 silicofluoride 0, I_2 mixed preservative (inorganic) 5, I_3 chlorinated naphthalenes 0, I_4 chlorinated naphthalenes – 1, mineral oil 'for wood impregnation' – 2, carbolineum RPV – 1, coal-tar oil RBV – 1, compared with 15 for a commercial fire-retardant.

1646. NEWKIRK, T. E. **Fire tests on untreated and treated Spruce in ventilation doors [in mines].** *Canadian Mining and Metallurgical Bulletin, Montreal* 42 (452), 1949 (642). D.S.I.R.

Results of tests on small-scale models indicated that ventilation doors treated with a 17% solution of chromated $ZnCl_2$ will remain useful for ½ hr. exposed to a temperature of 1,790° F., ¾ hr. at 1,350°, and 1½ hr. at 1,025°. Untreated doors failed in 7 min. and doors treated with a 4% solution in 12 min. at 1,700°. [Cf. *For. Abstr.* 12 (No. 584).]

1647. WEBSTER, C. J., and ASHTON, L. A. **Investigations on building fires. Part IV. Fire resistance of timber doors.** *National Building Studies Technical Paper* No. 6, 1951. pp. iv + 20 + 3 photos, 1 dgm. 2 refs. H.M. Stationery Office, London. Price 1*s.* 0*d.* [Building Research Station, Watford.] P.R.

844. *Attack by Plant Organisms*

844.1. Sap-staining Fungi

See Nos. 971, 1337, 1628, 1697.

844.2. Wood-destroying Fungi

See also Nos. 972–4, 1323 *et seq.*, 1392, 1621–4, 1629–30, 1652, 1657, 1696, 1698–9.

1648. FINDLAY, W. P. K. **A note on the fungi of less common occurrence in houses.** *Trans. Brit. mycol. Soc.* 34 (1), 1951 (35–7). O.B.D.

1649. MAYER-WEGELIN, H. Vom Einfluss des Verstockens auf die Eigenschaften des Buchenholzes. **[Effect of incipient decay on the properties of Beech wood.]** *Repr.* from *Holz-Zentralblatt, Stuttgart* No. 54, 1950. pp. 2. 10 refs. [G.] P.R.

Surveys the problem of dote in Beech wood, with its two causes (physiological and fungal), and reports on an investigation of the strength of the affected wood. It was found that in physiologically stained

wood the decrease in strength never exceeded 15%, whereas wood with white spots (fungal attack) showed a marked drop in strength. It is suggested that the term 'trunk rot' (Stammfäule) should be used only for fungus-caused changes, while the staining caused by vital processes in the cells themselves should be given another name ('Ersticken' or 'Einlaufen').

845. *Attack by Animals*

845.1. Marine Borers

See also No. 1625.

1650. SHIINO, S. M. **The marine wood-boring crustaceans of Japan. 1. Limnoriidae.** *Wasmann Journal of Biology, San Francisco* 8 (3), 1950 (333–58). 53 refs. O.R.S.

Describes, with illustrations, and discusses the boring habits and the distribution of, *Limnoria lignorum* and *L. andrewsi*.

1651. DODGE, B. O. **A fungus capable of parasitizing wharf-piling borers.** *Bull. Torrey bot. Cl.* 78 (3), 1951 (201–5). O.B.D.

Cultures were made of a fungus found occasionally parasitizing and killing borers in the piling of a New York wharf. It is thought to be a species of *Beauveria*.

845.2. Terrestrial Borers

See also Nos. 920, 1371, 1397, 1630–1, 1634.

1652. MAYNÉ, R., and DONIS, C. Insectes et champignons xylophages congolais. **[Wood-destroying insects and fungi of the [Belgian] Congo.]** *Bull. agric. Congo Belge* 42 (2), 1951 (319–46). 7 refs. [F.flem.]

A check list of species attacking both living and dead wood.

1653. BHATIA, B. M. **Borers of Sal poles and their control.** *Indian For. Rec.* (*n.s.*) *Entomology* 8 (4), 1950 (17–34).

Cf. *For. Abstr* 13 (No. 755).

1654. **Furniture beetles.** *Econ. Ser. Brit. Mus.* No. 11 [revised (5th?) ed.], 1951. pp. 34.

Contains an illustrated description and life history of both important and minor species; also methods of prevention and control.

1655. SPILLER, D. **Note on susceptibility of *Pinus radiata* D.Don timber to attack by the common house borer *Anobium punctatum* de Geer.** *N.Z. J. Sci. Technol.* 32*B* (5), 1951 (38–9). P.R.

1656. SPILLER, D. **Digestion of alpha-cellulose by larvae of *Anobium punctatum* De Geer.** *Nature, Lond.* 168 (4266), 1951 (209–10).

1657. BUTOVITSCH, V. Undersökningar över virkesförstörande insekters spridning och skadegörelse i boningshus i Blekinge län och Kalmar läns södra landstingsområde. **[Studies of the distribution of and damage done by wood-destroying insects in dwelling-houses in Blekinge county and the southern district of Kalmar county.]** *Medd. SkogsforsknInst., Stockh.* 40 (5), 1951. pp. 39. 7 refs. [Sw.g.]

Gives the results of a survey made in autumn 1948 by the Skogsforskningsinstitut of 513 houses of various ages in coastal and inland parishes, covering both insects and fungi but directed chiefly towards attack by *Hylotrupes bajulus*. The commonest pests (figures in brackets give % of houses attacked) were: *Callidium violaceum* (73·6), *Ernobius mollis* (54·0), *H. bajulus* (51·8), *Anobium punctatum* (39·8) and *Merulius lacrymans* (19·5). In contrast to experience in Germany and the Baltic States, the frequency of *H. bajulus* was lower in coastal than in inland parishes: its frequency increases with increasing age of house, but showed a decline for houses over 50 years old, probably owing to the better-quality timber (higher heartwood %) used in them. Attacks occurred chiefly in roof timbers, were quite common in dwelling rooms but exceptional in cellars; their extent and intensity were in most cases small. There was no demonstrable preference on the part of *H. bajulus* as regards species of wood (Pine or Spruce). Its frequency varied markedly with roofing material, being lowest in tiled roofs and highest in roofs of tiles laid over shingles. Attacks were especially frequent (70·8%) in houses built wholely or in part of timber from old houses that had been pulled down. Costs of sanitation measures (HCN fumigation followed by spraying with a fluorine-containing preparation) are considered.

The frequency of *Anobium punctatum* attack increased with increasing age of house and this beetle was much more frequent than *H. bajulus* in houses over 50 years old. It was most frequent in cellars, being probably favoured by cool, moist conditions. The extent and intensity of its attacks were mostly small, and total destruction of houses occurred in only two cases. *E. mollis* and *C. violaceum* occurred chiefly in attics; their occurrence is directly related to the amount of structural timber on which strips of bark have been left. *Anobium pertinax* was found in 11 houses, mostly in cellars. Woodwasp damage occurred in only 3 houses. Of the fungi, *Coniophora cerebella* was noted in 4·1% of the houses, usually in cellars. The much more frequent attacks of *M. lacrymans* were almost confined to attics. No correlation could be established between the frequency of this fungus and age of house.

1658. FISHER, R. C., and HARRIS, E. C. **A note on the status of the house longhorn beetle, *Hylotrupes bajulus* L., in Great Britain.** *Repr.* from *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (167–9). 4 refs.

1659. HESPELER, R. Erfahrungen bei der Bekämpfung des Hausbocks (*Hylotrupes bajulus*) in Nordwestdeutschland. **[Experience in the control of the house longhorn beetle in Northwest Germany.]** *Proc. 8th int. Congr. Ent., Stockh. 1948*, 1950 (785–91). [G.] O.H.

Discusses briefly prevention of attack by screening loft windows and treating wood for rafters, and methods of treating already infested wood by hot air, gas and chemicals.

1660. JACQUIOT, C. Les 'piqûres noires' du chêne. **['Black holes' [pin-holes] in Oak.]** *Étude tech. Inst. nat. Bois* No. 7, 1951. pp. 4. [F.] P.R.

Describes the life history of *Platypus cylindrus*, *Xyloterus* (*signatus* and *domesticus*), and *Xyleborus* (*monographus* and *dryographus*), the damage done, and methods of control.

845.3. Termites

See also No. 915.

1661. SNYDER, T. E. **Control of nonsubterranean termites.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 2018, 1950. pp. 16.

1662. WOLCOTT, G. N. **The termite resistance of pinosylvin and other new insecticides.** *J. econ. Ent.* 44 (2), 1951 (263–4). 6 refs.

Results of tests with pinosylvin, and a discussion of the efficacy of this and other insecticides in the protection of wood against *Cryptotermes brevis*, with a comparative table.

1663. JENNINGS, J. E. **Termite-proofing of buildings.** *Repr.* from *Bulletin, National Building Research Institute, Pretoria* No. 4, 1950. pp. 15. P.R.

The geographical distribution of termites causing damage to buildings in South Africa is given and their capacity for mounding in the subfloor space of buildings is described. In the Witwatersrand area the chances of a building becoming infested is one in two and the cost of repairs and disinfestation is high. The methods of infestation and the preferences of the termites are indicated: one species [*T. badius*] thrives best inside buildings. To combat termites, the colonies on the site should be eradicated before the building is started. An impermeable layer of poisoned soil should be provided under each building. With suspended floors, ventilation and provision of access for inspection are recommended: for solid floors, the concrete subfloor should be made crackfree, and itself act as an impermeable barrier. Finally all timber below the lintel of the ground floor should be treated with an approved preservative. *From author's summary.*

847. *Drying (Seasoning)*

See also Nos. 1502, 1512, 1549.

1664. SMITH, W. J. **Changes in circumferential dimensions of Douglas Fir poles during seasoning.** *B.C. Lumberm.* 35 (6), 1951 (44–6).

Circumferential measurements of 100 mountain-type Douglas Fir poles, 25 ft. long, were made at the butt, at 6 ft. from the butt, and at the top, when green, after 6, 9 and 12 months' air seasoning, and at the end of the 12 months' seasoning after butt-soaking to the ground line (5 ft. from the butt). Results are given in graphs and tables. They indicate that the average reduction in circumference from the green dimensions will not exceed 1% at 6 ft. from the butt after air seasoning. The average reduction in bending strength will not exceed 3%. The % recovery after soaking was 84·5 at butt and 16·2 at 6 ft. above butt. If Douglas poles have the required circumferential measurements at 6 ft. from the butt when green, it is not necessary to re-measure them at any stage of seasoning.

1665. **Efficient drying compartments.** *Wood-Worker, Indianap.* 70 (5), 1951 (28). P.R.

Describes a compartment made of a framework of 2 × 6 in. studding covered with a heavy canvas.

1666. HENDRY, R., and SCOTT, A. W. **Some fundamental aspects of air-drying of solids.** *Journal of the Institute of Fuel, London* 23 (134), 1950 (286–94). 14 refs. D.S.I.R.

Reviews some of the problems involved in the air-drying of solids, and the methods available for their solution. The properties of air and water-vapour mixtures are summarized. The construction of the psychrometric chart and its application to the analysis of drier performance are outlined. Different methods of presenting experimental data on drying are described, and consideration is given to the application of such data to the calculation of drying times in full-scale driers. The principles of evaporation of water vapour from saturated surfaces into an air stream are summarized; the mechanisms of moisture movement within a material during drying and their influence on drying rates are briefly discussed. *Authors' summary.*

1667. REID, J. S. **Kiln drying schedules.** *Inform. Ser. N.Z. For. Serv.* No. 8, 1950. pp. 11.

Contains instructions for kiln drying, and 10 schedules referring primarily to the type of kiln most widely used in New Zealand for the drying of indigenous timbers, viz. the internal-fan, reversible cross-circulation compartment, *ca.* 32 ft. in internal length.

1668. [KNIGHT, E.] **Moisture factor and degrade.** *Timberman* 52 (10), 1951 (129–31).

Experiments in kiln drying of Ponderosa Pine showed that degrade increased rapidly between 13 and 9% moisture contents, and that the saving in shipping cost by drying to 9% is more than offset by loss through degrade, especially in grades 1 and 2. Drying to 12–13% is recommended for most stock, as the exterior moisture equilibrium for most parts of the U.S.A. is 12%, with further drying for special stock such as panelling.

1669. MCMILLEN, J. M. **The seasoning of Hickory lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1794, 1951. pp. 7 + 1 photo, 1 dgm., 2 gphs., 1 tbl. P.R.

Describes kiln schedules of the accelerated type.

1670. HOPKINS, W. C., and KELSO, W. C., JR. **Kiln-drying of Hickory handle stock: pilot tests of drying schedules.** *Sth. Lumberm.* 182 (2285), 1951 (40–2).

Results of tests on 3 schedules (1 for green stock with pinking allowed, and 1 for green stock, and 1 for stock air-dried to 16% moisture content, with no pinking allowed) are given in graphs and tables. All 3 schedules were satisfactory. No more pinking need be expected from loose- and medium- than from tight-barked trees.

1671. MOTTET, A. L., and RING, W. C. **Controlling moisture content in cabinet production.** *Wood, Chicago* 6 (6), 1951 (18–9, 33–6). P.R.

Investigations conducted in the research laboratory of the Long-Bell Lumber Co. proved that most of the difficulties now experienced with dimension control can be eliminated by ensuring that the wood is initially dried to, and subsequently delivered to the customer at, the proper moisture content. The aim of the investigation was to develop a method of obtaining precise control of moisture content (m.c.) in factory products, mainly in edge-glued kitchen-

cabinet doors and cabinet verticals made of 4/4 × 6VG and 4/4 × 12 FG Fir and Hemlock. Acceptable m.c. was set at 6–9%, with 8% as optimum; the maximum tolerance of individual pieces with m.c. exceeding 10% was to be 3% of the total number of pieces. It was found that both insufficient control of m.c. at the kilns and moisture absorption during storage and manufacturing, were responsible in about equal degree for the excessive m.c. in products. M.c. determinations were effected with moisture meters, which were found to give results as accurate as oven tests. Tests on kiln performance led to some improvements in stacking and modification in kiln schedules. Tests on the rate of moisture absorption in cooling sheds point to the necessity of giving shop lumber priority over other items in order of removal from the sheds, and controlling its passage through the kilns so as to minimize accumulation of stocks. Considerable improvement of products was obtained by providing enclosed heated storage adjacent to the machining site, a heated area for the packaging (and bundling) line, and a heated warehouse. Two control points were provided: (1) at the unstackers, from which samples of recently dried kiln charges were taken for tests (degraded lumber being sent back for re-drying); (2) at the factory cutting line where 'wet' stock is rejected.

1672. RIETZ, R. C. **News and views of this kiln drying business. The problem: What are some of the advantages and disadvantages of package-loaded kiln trucks.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1769–8, 1951. pp. 1. P.R.

1673. STEVENS, W. C. **The seasoning of wood at temperatures above the boiling point of water.** *Wood* 16 (7), 1951 (260–2). [Forest Products Research Laboratory, Princes Risborough.]

Discusses methods of seasoning by radio-frequency, vapour, super-heated steam and vacuum drying.

1674. EISENMANN, E. Schnelltrocknung von Holz mit niedrigen Temperaturen. **[Quick-drying of timber using moderate temperatures.]** *Holztechnik* 31 (6), 1951 (164–7). [G.] P.R.

Describes the principle, construction, operation and working cost of the Griesinger Klima-Spiral-Zentrifuge (hydro-extractor with spiral air circulation) patented and constructed in Germany. The essential improvements of the apparatus, as compared with the original idea of C. F. Kastmark [*Trävaruindustrien* 9, 1943 (134)], are: (1) use of the fan effect of the rotating pile in such a manner that the air as a whole does not rotate along with the pile, resulting in a more uniform temperature distribution and drying rate; (2) use of a condensation plate to ensure equalization of air humidity inside the apparatus, which greatly improves the drying rate. The apparatus is constructed in several sizes, e.g. for 1·25 cu.m. (boards up to 2·5 m. long), or for 5–10 cu.m. of timber. The smaller model is fitted with a motor (2 KW) and electrical heating (5 KW). Reduction to ca. 20% moisture content is effected without heating; this is switched on when drying to 6–8% moisture is desired. The following figures are given for drying rates: 24-mm. Spruce boards were dried from 150 to 12% moisture content in 16 hr. Drying from 50–60% down to 8% moisture content proceeds at a rate of ca. 4% per hr. Final moisture differences do not exceed 3%. Since the highest temperature in this process is 40° C., the seasoned timber is free from cracks and resinification, and is not discoloured. Beech-wood boards (40 mm. thick) of initial moisture content 57%, were dried at 40° C. at a rate of 0·55% per hr. Birch blocks (for the manufacture of spools) were dried at 5% per hr., compared with 4% per hr. for high-temperature (106°C.) drying. Drying costs are compared for Spruce boards, 24 mm. thick, from 35% to 8% moisture content, for various drying methods, viz. (1) brick-built kiln, usual type—8 to 15 DM/cu.m. of oven-dry wood; (2) high-temperature drying apparatus (*a*) electrically heated—10·89 DM/cu.m., (*b*) steam-heated—6·36 DM/cu.m.; (3) spiral hydro-extractor —4·78 DM/cu.m.

1675. Natürliche Schnelltrocknung mit abgestimmter Luft. **[Natural quick-drying with conditioned air.]** *Holztechnik* 31 (8), 1951 (225–6). [G.] P.R.

Describes the principles underlying the accelerated natural seasoning of wood, i.e. natural quick-drying by e.g. the method of swinging or rotating, conducted in a closed space through which passes air the temperature and humidity of which are controlled both at the intake and the exit. Two graphs—moisture content of wood as a function of relative humidity and temperature of air, and temperature required for obtaining the relative air humidity desired—are included to explain the examples given.

848. *Timberyard Practice. Handling and Storage of Timber*

See also Nos. 1696–9.

1676. **Steel strapping.** *Timber of Canada* 11 (11), 1951 (28–30, 56, 58).

Discusses the use of steel strapping to bundle sawn goods, plywood, logs, pulpwood etc. for transport.

1677. **How to keep log ponds from freezing.** *Lumberm.* 78 (8), 1951 (108–10).

Describes pond-heating systems used by the Diamond Match Co., Spokane, Wash., the Brown's Tie and Timber Co., McCall, Idaho, and the Pack River Lumber Co.

1678. ERNST, A. **Water dozer speeds log pond booming.** *Wood, Chicago* 56 (8), 1951 (29, 62). P.R.

Describes a 16-ft., steel-sheathed, 'log-herder' boat with a 100-h.p. engine, designed and built in 1949. Many such boats have been added since to the Weyerhaeuser fleet. They are highly manoeuvrable, and their use speeds up log-pond work and makes it safer.

1679. SAINMONT, C. Grues, portiques et ponts roulants dans l'industrie du bois. **[Cranes, gantry cranes and travelling cranes in the timber industry.]** *Rev. Bois Appl.* 6 (7/8), 1951 (9–11). [F.]

An illustrated description of the machines and their operation.

85. GRADING OF WOOD AND WOOD PRODUCTS

852. *Detection, Recognition and Assessment of Injuries and Defects*

See also Nos. 1499, 1668.

1680. ZUCCA, J. J. **A study of acorns found buried in a Redwood tree.** *Wasmann Journal of Biology, San Francisco* 8 (3), 1950 (257–65). 6 refs. O.R.S.

Acorns of *Lithocarpus densiflorus* were found buried in the heartwood of *Sequoia sempervirens*. A study of the holes suggests that they were deposited by the woodpecker *Balanosphyra formicivora bairdi*, and of the growth rings, that one layer was deposited 235 and the other 200 years ago. The bark of the tree shows recent acorn storage activity but all the holes were empty.

1681. PAUL, B. H., and SWEET, C. V. **Quality control in manufacturing of lumber from second growth.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1784, 1949. pp. 7 + 2 photos. P.R.

Discusses the trade difficulties connected with the grading, moisture relations, and warping behaviour of lumber before and during use. Lists the following five general causes of the twisting of lumber cut from second-growth timber: crooked logs, growth rings of sharp curvature, spiral grain, growth stresses, and high longitudinal shrinkage. Gives practical instructions on how to improve the quality and behaviour of timber from young second-growth stands, particularly from the Southern Yellow Pine area.

854. *Grading of Converted Timber*

See also Nos. 1594–6, 1599–1603.

1682. **Export R. list. Grading and dressing rules [for Douglas Fir, Pacific Coast Hemlock, Sitka Spruce and Western Red Cedar for export shipment].** Pacific Lumber Inspection Bureau, Inc., Seattle, Wash. 1950. pp. 130.

1683. LEWIS, S. H. **Grading of hardwoods. II. North American hardwoods.** *Emp. For. Rev.* 30 (3), 1951 (226–33).

An exposition of the National Hardwood Lumber Association's rules.

1684. JEFFERIES, R. **Grading of hardwoods.** *Emp. For. Rev.* 30 (2), 1951 (125–30).

Reviews the systems used in different parts of the world, dealing in rather more detail with Africa.

1685. **The Malayan grading rules (export) for rough sawn timber.** Department of Forestry, Malaya. Revised ed., 1951. pp. 43. Price $1 (2*s.* 6*d.*).

Cf. *For. Abstr.* 11 (No. 2151).

1686. **General requirements for Service telecommunication equipment.** *Inter-Service Specification, Radio Components Standardisation Committee, Ministry of Supply* No. *RCS*/1,000, 1950. pp. 116. P.R.

Includes specifications for timber, and tables indicating timbers naturally resistant to fungal decay and some woods of intermediate or no natural resistance; resistance to impregnation is also indicated. Stresses the corrosion of Pb, Pb alloys, Fe, steel, Al and Al alloys, when in direct contact (or in confined spaces without ventilation) with Oak, Chestnut, and Western Red Cedar.

86. PULP INDUSTRIES. CHEMICAL UTILIZATION OF WOOD

See also No. 1469.

861. *Paper and Cardboard Industry (Pulp, Paper, Cardboard, Fibreboards)*

See also Nos. 1048, 1470, 1501, 1553–4.

1687. **Research for the pulp and paper industry in the South by Chemical Engineering Department.** *Bull. Fla. Engng. industr. Exp. Sta.* No. 38, 1950. pp. 21. P.R.

Describes the Pulp and Paper Laboratory at the University of Florida, the research in progress and plans for the future.

1688. RISI, J. L'utilisation des essences feuillues dans la fabrication des pâtes et papiers. **[The use of hardwoods in the manufacture of pulp and paper.]** *Schweiz. Z. Forstw.* 102 (7), 1951 (321–31). 27 refs. [F.g.]

A general review, with a more detailed discussion of 'Chemigroundwood'.

1689. SEABRA, L. S. V. DE. Alguns ensaios para o conhecimento do valor da madeira de castanheiro na indústria do papel. **[Experiments to find the value of Chestnut wood in the paper-making industry.]** *Publ. Serv. flor. aqüic. Portugal* 12 (1/2), 1945 (78–95 + 4 photos). 9 refs. [Port.e.]

Laboratory experiments showed that the wood is unsuitable for mechanical pulps. A strong semi-chemical pulp is produced, but it has a poor colour and is only suitable for dark wrapping papers and cardboard. The alkaline process gives a strong pulp, but one not easily bleached, owing to the presence of tannins and other colouring matters in the fibres.

1690. STROJIN, F. Uporaba odpadkov taninske industrije. **[Utilization of tannin [wood residue] waste.]** *Les, Ljubljana* 2 (2), 1950 (33–5). [Sloven.]

Describes the utilization of the waste (Slavonian Oak and Chestnut) wood in the manufacture of pulp (paper, artificial silk), and various fibreboards.

1691. CHITTENDEN, A. E., COOMBER, H. E., and CORNEY, N. S. ***Eucalyptus saligna* wood from South Africa.** *Colon. Plant Anim. Prod.* 1 (4), 1950 [1951] (299–308).

Investigation (full results given in tables) showed that it was possible to produce satisfactory yields of unbleached soda or sulphite pulps from *E. saligna* wood, but the pulps were of poor strength. [Cf. *For. Abstr.* 12 (No. 1335).]

1692. MONTEIRO, R. F. ROMERO. *Oxytenanthera abyssinica* Munro, um bambú africano. Subsídios para o conhecimento do seu valor na indústria da celulose. **[*O. abyssinica*, an African Bamboo. Contributions to a knowledge of its value in the cellulose industry.]** *Agron. angol.* No. 2, 1949 (59–73). [Port.f.e.]

Results of a chemical analysis of the wood and of pulps produced by the soda process. The pulps have a high α-cellulose content and economic bleachability. The author concludes that the species is worth further investigation.

1693. BHAT, R. V., and VIRMANI, K. C. **Indigenous cellulosic raw materials for the production of pulp, paper, and board. Part 1. Pulps for writing and printing papers from *Arundo donax*.** *Indian For.* 77 (6), 1951 (365–73). 11 refs.

Laboratory trials indicate that by sulphate pulping, yields approaching those from sabai grass (*Eulaliopsis binata*) in both quantity and quality can be obtained. Pilot-plant tests will follow.

1694. BHAT, R. V., and JASPAL, N. S. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part II. Pulps for writing and printing papers from the Castor Oil plant (*Ricinus communis*).** *Indian For.* 77 (7), 1951 (450–63). 12 refs.

1695. BHAT, R. V., and GUHA, S. R. D. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part III. Semi-chemical and chemical pulps from *Lannea grandis* (Jhingan).** *Indian For.* 77 (9), 1951 (568–83). 9 refs.

Full data are tabulated.

1696. WEGELIUS, T. Selluloosapuun tehdavarastointi. [**Mill storing of pulpwood.**] *Pap. ja Puu* 33 (6), 1951 (218–21). [Fi.e.] P.R.

In land storage, rot can be avoided either by spraying the stacks to keep the wood moist (recommended for shorter pulpwood lengths) or by piling long lengths (6 ft. or over) so that they can dry out as much and as quickly as possible. The possibility is discussed of storing material, especially for sulphate pulp, in the form of chips in large heaps; this method is easy and cheap, and does not affect the quality, at least of kraft pulp. Storing wood in bundles under water saves space and gives a more even quality and better yield of pulp. To avoid discoloration, it must be barked before bundling.

1697. **Protection with chemicals. How it is done at Gaylord Container Corp.** *Pulp and Paper, New York* 23 (11), 1949 (78, 80). L.S.

This corporation (Bogalusa, La.) has been spraying with a Dowicide 'S' mixture the ends of pulpwood to be sent to reserve stock. As a result of the spraying, pulpwood arriving in late spring and summer can be held in storage for 4 months without damage from sap-stain or mould, as against 3 months for untreated material (the corresponding figures for autumn and winter are 6 and 4 months respectively).

1698. PASCOE, T. A., and SCHEFFER, T. C. **Jack Pine pulpwood deterioration in yard storage.** *Pulp Paper Mag. Can.* 52 (7), 1951 (184, 186, 189, 190, 193, 196–7). 11 refs.

A quantity of Jack Pine pulpwood from a single tract in Wisconsin was stored in typical yard conditions for 21 months. The material was either rough or peeled, and either treated with a 5% solution of Dowicide G, or untreated. Records were kept of the rate of loss of moisture and density and of the progress of decay in the pulpwood, and pulping tests were carried out during the period. Results, given in graphs and tables, apply only to the untreated wood, as no significant differences were found between treated and untreated material. The % loss of volume and certain visible characteristics of the wood (defined, and classed as 1–4) are used together to give a decay index. Rough wood showed much greater damage from decay than peeled wood, with a loss in pulp yield of up to 10% calculated on a wood volume basis; the rate of damage was greatest during the early period of storing. Pulp strength decreased with increasing storage time. There was only negligible decay in peeled wood during the period, but some loss of pulp strength occurred, increasing with length of storage. Immediate use of Jack Pine after felling is recommended for highest possible pulp quality. If storage for more than 4–6 months is necessary in hot weather, the wood should be peeled.

1699. MIURA, I., and MIGITA, N. **Chemical studies of Buna [*Fagus crenata*] wood and its pulp. Parts I and II.** *Bull. Tokyo Univ. For.* Nos. 31; 32, [1943] (59–94; 117–22). 15 refs. [Jap.jap.]

Three lots of timber were cut on 7 September, 26 October and 2 December, from a total of 48 trees, separately stacked outdoors, and sampled at 0, 1, 2, 3, 6 and 12 months for condition, density and sulphite pulping characteristics. After 3 months' stacking no degrade was observable. After 6 months, decay was apparent in the lots cut in September and October and had reduced both their volume and weight, while in the lot cut in December decay had gone further and changed the composition also. By 12 months after stacking, all lots had thoroughly decayed. Decay adversely affected chemical digestion, bleaching, pulp yield, and pulp and paper quality. Pulping procedures are discussed and it is concluded that September to late October is the best period for cutting Buna for pulping.

Tests on timber kept for periods up to 4 years showed a progressive decrease of cellulose yield and pulp quality. After 2½ years' storage the yield had fallen to 60% of that from fresh sound wood; pulping after the 2nd year's storage is difficult and uneconomic.

1700. WATSON, C. A. **The sources of wood dirt in unbleached [sulphite] pulps.** *Tappi* 34 (7), 1951 (311–3). 2 refs. P.R.

Pulping experiments were made on normal-sized pulping logs, 8-ft. logs, chips from sawmill waste, slabs, logs stored 2 years or more in salt water, and logs containing large amounts (about 10%) of centre rot and brown stringy rot, used within 6 months of felling. Results are given in graphs and tables showing the proportion of specks, and of shives and hairs, and the % of dirt arising from each dirt source (rot, pitch, knots, stain, bark and worm holes). The figures given make it possible to predict the dirt content of any combination of wood supplies, the dirt reduction obtainable if any particular type of dirt were removed at the sawmill, and the cost of obtaining pulp of specified cleanliness by varying the wood supply, by cleaning the wood, or both.

Pulping and Pulp

See also Nos. 1527, 1532, 1714, 1717.

1701. ADLER, E., and STOCKMAN, L. **Sulphite properties of Spruce wood from unpeeled, floated logs. Part II. Sulphite cooking experiments.** *Svensk PappTidn.* 54 (14), 1951 (477–82). 8 refs. [E.sw.g.e.] P.R.

Some experimental methods of increasing pulp yield from the resistant surface wood of floated logs are described. They support the view that pulping resistance is due to the presence of flavotannins.

1702. PERILÄ, O., and ROSCHIER, H. Tutkimuksia selluloosan kuitupituusfraktioiden kemiallisista ominaisuuksista. **[An investigation on the chemical properties of various fibre-length fractions of pulp.]** *Pap. ja Puu* 33 (9), 1951 (269–72). 15 refs. [Fi.e.] P.R.

Unbleached Aspen and bleached and unbleached Spruce sulphite pulps were separated into 3 fractions by fibre length, and the fractions were tested for their chemical properties. The parenchyma cells of Aspen pulp were found to contain less α-cellulose and pentosan, and more resins, fats, waxes, ash and lignin, than the other cells; their copper number was higher and their degree of polymerization lower. Vessels contained a little less α-cellulose and pentosan, and rather more resins, fats, waxes, ash and lignin, than the libriform cells, and their copper number was higher. The vessels reacted best, and the parenchyma cells least well, to xanthogenation. The parenchyma cells of Spruce pulp contained less α-cellulose than the tracheids, and more resins, fats, ash and lignin. Their copper number was higher, their degree of polymerization was lower, and they were easier to bleach. Reactivity to xanthogenation and pentosan content were about the same for both. *From authors' summary.*

1703. NEILSON, J. E. **Progress in bark burning equipment for steam generation in paper mills.** *Pulp Paper Mag. Can.* 52 (6), 1951 (99–101).

Fibreboards

See also Nos. 1508, 1518, 1551, 1614, 1690.

1704. CHITTENDEN, A. E., and COOMBER, H. E. **The suitability of *Brachystegia, Isoberlinia* and other hardwoods of Northern Rhodesia for the manufacture of fibre boards.** *Colon. Plant Anim. Prod.* 1 (4), 1950 [1951] (294–9).

Gives length and diameter of fibres for 2 species of *Brachystegia*, 7 of *Isoberlinia*, *Marquesia macroura*, *Parinari mobola*, and *Uapaca kirkiana*. All have the short ultimate fibres characteristic of hardwoods and unsuitable for the manufacture of fibreboard.

1705. **Manufacture of panels from sawdust and straw.** *Technical Division Reports, Office of Technical Services, U.S. Department of Commerce, Washington, D.C.* No. *IR*–5975 [*n.d.*] pp. 2. P.R.

A short bibliography of research done in Madison.

1706. WRIGHT, G. W. **Waste wood boards and corestock.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 184, 1951 (1–4).

A technological and economic discussion of the possibilities of developing waste-wood binder products in Australia.

1707. MACDONALD, M. D. **Manufacture of consolidated products from wood residues.** *Paper Tr. J.* 132 (23), 1951 (20, 22–4, 26, 28). 6 refs. P.R.

Describes in detail the dry-process manufacture of boards from wood waste. The optimum moisture content of the wood waste (shavings and the like) is 4%, the optimum size of wood particles falls within 0·05 to 0·25 in. mesh, and the minimum quantity of binder used is 2·5% of the weight of the board; no useful purpose is served by increasing the binder content above 3·5%. The mid-thickness temperature during pressing should reach 250° F., a pressure of 200–600 lb./sq. in. being desirable for most products, and pressures up to 5,000 lb./sq. in. for diepressed materials. The moisture content of wood waste is maintained at the proper level, and diffusion of the binder into the material facilitated, by the use of a water-soluble phenol-formaldehyde resin binder that is sprayed on the wood-waste particles; the spraying apparatus is illustrated and described. The boards can be either unfaced or faced with paper, veneer, or cloth. Strength tests show that the modulus of rupture drops sharply when the resin content falls below 2%, rises steadily up to 6% resin content and then tapers off. Water-absorption tests show that for boards with a binder content of 2% or less, the absorption rate is high, and that it decreases with increased binder content up to 3·5%, any change beyond that point being insignificant.

1708. FARBER, E. **Hardboard from wood.** *Paper Tr. J.* 132 (18), 1951 (22, 24, 26, 28). 6 refs. P.R.

Describes the development of a special hardboard, primarily designed for use as the face material of wirebound boxes, from hardwood waste. A new method of converting hardwood waste into pulp was used, giving a pulp yield of 85–90%. From this material, hardboard of medium density and hardness was obtained. Melamine (3%) and gelatinized wood (gelwood, 10–15%) were used as binders. The quality of boards was improved by the addition of 20% of softwood kraft pulp.

1709. ANDERSON, A. B., and RUNCKEL, W. J. **Utilization of Douglas-Fir bark in hardboard.** Oregon Lumber Company Research Laboratory, Portland, Oregon. [*n.d.*] pp. 17. 3 refs. P.R.

It has been shown that 20–45% of the bark, together with the wood, is a suitable raw material for making a quality hardboard. Since the bark acts as a good water-repellent agent, no chemicals are needed in the hardboard.

1710. ÖGLAND, N. J., and EMILSSON, E. B. Värmebehandlingens inverkan på hårda träfiberskivors böjhållfasthet och elasticitet. **[The effect of heat treatment on the bending strength and elasticity of hardboards.]** *Svensk PappTidn.* 54 (17), 1951 (597–600). 8 refs. [Sw.e.] P.R.

Heat treatment of hardboard increases its stiffness, bending strength, modulus of elasticity and 'elastic bending strength' [cf. *For. Abstr.* 11 (No. 2068)]. Graphs are given showing the influence of moisture on strength and elasticity, and the deflection of

boards and of Spruce of different moisture contents, under static loads.

863. *Wood Hydrolysis. Saccharification*

See also No. 1713.

1711. KURTH, E. E., FOSTER, D. H., INGLES, O. G., RALPH, B. J. F., and SHIPP, M. H. R. **The acid hydrolysis of Australian woods. Hydrolysis of the wood of *Eucalyptus obliqua* L'Herit. by a percolation technique.** *Aust. J. appl. Sci.* 2 (1), 1951 (184–99). 7 refs. P.R.

The acid hydrolysis of the wood of a Tasmanian specimen of *E. obliqua* has been studied at temperatures of 162, 173, and 183° C., and at H_2SO_4 concentrations of ¼, 1, and 2%. The yields of pentose, hexose, and free furfural have been determined. The hydrolysis approximates in characteristics to a reaction of the 1st order and the rate constants have been determined for the conditions employed. *Authors' summary.*

1712. HALLONQUIST, E. G. **Catalytic hydrogenolysis of wood.** *Industr. Engng. Chem.* 43 (6), 1951 (1427–30). 15 refs. P.R.

Presents in the form of tables the results of an investigation carried out to explore the possibilities of hydrogenation with concomitant hydrolysis in converting wood to distillable liquids. Douglas Fir, Alder, and Redwood were investigated. Optimum yields of slightly more than 50% of the weight of the wood were obtained as non-aqueous distillable liquids. Ni catalysts were the most effective, and yields varied considerably, depending on the amount of catalyst used and the time and temperature of reaction. The quantities of gas and water formed, and the amount of unreacted material remaining, were determined for various conditions. *From author's summary.*

865. *Plastics*

1713. HUDSON, M. S. **Treating wood.** *U.S. Patent* No. 2,538,457, Jan. 16, 1951. *Chem. Abstr.* 45 (10), 1951 (4452e).

Wood is hydrolysed and then dried in organic media to produce a dry material suitable for moulding and containing practically no water-soluble or organic-solvent-soluble extractives. The processes of hydrolysis and of drying, as well as the apparatus used, are described.

1714. HOWELLS, T. A., and GOMS, R. H. **Redwood plastic pulp for phenolic resin laminates.** *Tappi* 34 (3), 1951 (121–5). P.R.

The substitution of Redwood (*Sequoia sempervirens*) plastic pulp (a product with semiplastic properties, obtained when *S. sempervirens* is cooked by the explosion method) for a part of the pulp in a phenolic-resin saturating kraft paper permitted the attainment of a given degree of density, hardness, and water absorption at a somewhat lower resin content. This effect was, however, accompanied by a decrease in the strength of the handsheets and in the tensile and flexural strength of the laminates made from them. *From authors' summary.*

866. *Utilization of Wood Extractives*

See also Nos. 1537–42, 1690.

1715. **[Essential oil from the wood of *Brachylaena hutchinsii*.]** *Colon. Res., Lond.* 1950/51, 1951 (53).

1716. ANDERSON, H., and STEEDEN, H. **A note on the chemistry of Eucalyptus wood tannins.** *Journal of the Society of Leather Trades' Chemists, Croydon* 34 (12), 1950 (478–80). 1 ref. L.S.

Presents results of qualitative (and some quantitative) tests carried out with an extract of *E. redunca* wood.

1717. SAGOSCHEN, J. A. **Buchensulfitablaugen als Rohstoff für Gerbextrakte. [Beech-wood sulphite liquors as raw material for tanning extracts.]** *Leder, Darmstadt* 2 (2), 1951 (25–9). 7 refs. [G.] L.S.

A tanning extract has been manufactured from Beech-wood sulphite liquor in Austria since 1948–9. The liquor seems to be better than Spruce sulphite liquor as a raw material for tanning extracts. The method of obtaining the extracts is described in detail.

867. *Destructive Distillation*

1718. DALIN, D., and HEDBÄCK, T. J. **Distillation of wood, shale, etc.** *Brit. Patent* No. 648,744, 1950. *Fuel Abstr.* 9 (3), 1951 (28). P.R.

89. OTHER ('MINOR') FOREST PRODUCTS

892. *Vegetable Products*

See also No. 1469.

892.1. Grass. Leaf Fodder. Litter

See also No. 1410.

1719. KEHAR, N. D., and DEB GOSWAMI, M. N. ***Bauhinia variegata* leaves as cattle feed.** *Sci. & Cult.* 16 (10), 1951 (476–7). D.S.I.R.

Chemical composition, contents of digestible proteins and starch equivalent, and feeding trials on goats, show that leaves of *B. variegata* are not inferior to any of the following cultivated fodder plants: berseem, lucerne, juar, and maize.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 1234–5, 1531, 1709, 1716–7, 1726.

1720. KURTH, E. F., and HUBBARD, J. K. **Extractives from Ponderosa Pine bark.** *Industr. Engng. Chem.* 43 (4), 1951 (896–900). 18 refs. P.R.

Ponderosa Pine bark taken from sawlogs 24–36 in. in diameter at Sisters, Ore., are found to contain ca. 25% extractives. Tannin to the extent of 5·6–11·4% and wax equivalent to ca. 5% of the dry weight of the bark were obtained. The wax is composed of fatty alcohols, fatty acids, and resin acids. A new flavonoid was isolated. *From authors' summary.*

1721. DUNCAN, D. B., and MARTIN, P. J. **Note on the effect of various factors on tannin content in native populations of Black Wattle.** *Journal of the Society of Leather Trades' Chemists, Croydon* 35 (2), 1951 (54–6). 2 refs. L.S.

A statistical examination of data from 137 lots of Black Wattle bark has been made. Geographical origin was found to have a significant effect on tannin content. *From authors' summary.*

1722. Opačić, I. Ekstrakcija rujevog lišća. [Extraction of Sumac leaves.] *Šum. List* 74 (7/8), 1950 (304–13). 10 refs. [Croat.]

Contains botanical, geographical, and technological data for the leaves of *Rhus cotinus* (the native Sumac), *R. typhina* (introduced from France and Czechoslovakia and well acclimatized in Jugoslavia), and *R. coriaria* (leaves imported from Sicily before the war). Dry leaves (moisture content 15%) contain, in the order of species mentioned above: tannin 16–22, 18–30, 22–26%; non-tannins 12–16, 14–18, 12–14%; red dyestuff 0–1, 2–6, 0–0·5%. The % of tannin in leaves of *R. cotinus* increases from July until October, and then decreases, but in October the leaves are red, which detracts from their quality. The tannin content rises with the age of the plant, and attains a maximum at 10–15 years. *R. typhina* attains maximum tannin content in November, immediately before the shedding of leaves. The Jugoslavian tannin is extracted in diffusers, the temperature being higher and time of diffusion longer, for *R. typhina* than for the other two species. The usual products are a viscous liquid containing up to 25% tannin, or a powder containing 56%. The former contains up to 3% of sugars. It is possible to extract 92–93% of the tannin contained in leaves of *R. cotinus*. High-temperature leaching (95° C.) of *R. typhina* leaves gives almost the same recovery %.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also Nos. 965, 1241–2.

1723. Durham, O. C. **The pollen harvest.** *Econ. Bot.* 5 (3), 1951 (211–54). 25 refs.

Discusses briefly pollen allergy, method of clinical evaluation, the botanical aspects of aerobiology, collecting methods, cleaning, drying and marketing the crops, and the manufacture, properties, and standardization of pollen extracts for clinical use. Discusses in more detail the pollens of individual species and genera with information on microscopic appearance, toxicity, and price per gram. Among the trees mentioned as important factors in hay fever are: *Pinus* spp., *Phoenix dactylifera*, *Populus sargentii*, *P. fremontii*, and *P. macdougalii*, *Juglans* spp., *Carya* spp., *Corylus avellana*, *Alnus rubra*, *Quercus* spp., *Ulmus* spp., *Platanus* spp., *Fraxinus oregona* and *F. velutina*, *Olea europaea* and *Ligustrum vulgare*.

1724. Tehon, L. R. **The drug plants of Illinois.** *Circ. Ill. nat. Hist. Surv.* No. 44, 1951. pp. 135.

1725. Letouzey, R. La cortisone donnera-t-elle une très grande valeur au *Strophanthus*. [Will cortisone make *Strophanthus* very valuable?] *Bois For. Trop.* No. 17, 1951 (41–8). [F.span.e.]

Gives a short account of the present uses of the genus, and a key for distinguishing 8 species occurring in the Cameroons.

1726. Schlittler, E., and Gellért, E. Über das Alkaloid Kamassin aus *Gonioma kamassi* E. Mey. [The alkaloid kamassin from *G. kamassi*.] *Helvetica Chimica Acta, Basel* 34 (3), 1951 (920–2). 9 refs. [G.g.] O.R.S.

The characteristics of kamassin isolated from the bark of *G. kamassi* are described.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 1236–41, 1715, 1720.

1727. Pejoski, B. Smolarenje ariša i arišev balsam. [Tapping of Larch and its oleoresin.] *Šum. List* 74 (12), 1950 (465–9). 11 refs. [Croat. croat.g.]

Tests on 'Venice turpentine' obtained from Larch trees in Northern Slovenia show that, so far as the % content of turpentine, the sp. gr., and the refractive index are concerned, this oleoresin is identical with best Italian (Alto Adige) Venice turpentine. The filtered product had a specific gravity of 1·00, and refractive index $n_{20} = 1·511$.

1728. Pejoski, B. Prilog poznavanju makedonskih borovih smola. [Macedonian Pine resins.] *Šum. List* 73 (8/9), 1949 (257–69). [Serb. russ.e.]

Macedonia is the principal and oldest resin-producing region of Jugoslavia. Home production before the war supplied 5% of the demand for resin products, as against ac. 25%. in 1948. The following species are tapped in Macedonia: *Pinus nigra*, *P. sylvestris*, and, to a small extent, *P. peuce*. Results are presented of investigations on the composition of resin (rosin, turpentine, impurities), conducted between 1934 and 1947 on the 3 species mentioned. Results are also given of physical and physico-chemical analyses of oleoresin, rosin, and turpentine from *P. nigra*.

1729. Pejoski, B. Smola i balzam munike. [The crude and filtered oleoresin of *Pinus heldreichii* Christ. var. *leucodermis* Antoine Markgraf.] *Šum. List* 75 (1/2), 1951 (85–91). 9 refs. [Croat.e.]

Results of experimental work on resin from *P. heldreichii* var. *leucodermis*, conducted in Zagreb and Skoplje in 1949–50. The July/August 1950 resin, when filtered later in the same year, yielded from 29 to 33% balsam. Steam distillation carried out with crude resin, balsam, and filtration residue, gave the following approximate yields of rosin, turpentine oil, and impurities respectively: crude resin—71, 19, 10%; balsam—74, 25, 1%; filtration residue—80, 11, 9%. The balsam had a sp. gr. of 0·995, and a refractive index of 1·516; corresponding figures for the turpentine oil were 0·864 and 1·466. The rosin obtained is of light colour. The properties and uses of the balsam are similar to those of *P. peuce* balsam. [Cf. *For. Abstr.* 12 (No. 3293).]

1730. Verghese, J., and Gulati, K. C. Turpentine oil from *Pinus longifolia* Roxb. *J. sci. industr. Res., India* 10*A* (3), 1951 (112–3). 30 refs. D.S.I.R.

A survey of literature.

1731. Mirov, N. T. Composition of gum turpentine of Pines: a report on *Pinus echinata*, *P. rigida* [both from N. Carolina] and *P. ponderosa* from Utah. *J. Amer. pharm. Ass.* (*sci. Ed.*) 40 (8), 1951 (410–3). 8 refs. O.R.S.

Cf. *For. Abstr.* 12 (Nos. 1496–7.)

1732. **[The resin of *Canarium schweinfurthii*.]** *Colon. Res., Lond. 1950/51*, 1951 (53).

The resin contains a volatile oil, the main constituent of which is (+)-limonene. The neutral, non-volatile fraction contains a triterpenoid diol differing from known diols of this series.

1733. SHAW, A. C. **The essential oil of *Tsuga canadensis* (L.) Carr.** *J. Amer. chem. Soc.* 73 (6), 1951 (2859–61). 11 refs. O.R.S.

Foliage from *T. canadensis* was distilled by steam to give a 0·249% yield of essential oil. Constituents totalling 90·6% of the original oil were separated by fractional distillation and identified.

1734. VELHO, H. DE L. ABREU, and XABREGAS, J. LOPES. Composição dos óleos de palma de Angola. **[The composition of palm oils from Angola.]** *Agron. angol.* No. 3, 1950 (133–42). 11 refs. [Port.f.e.]

An analysis of oils of *Elaeis guineensis* from 18 different localities.

1735. VELHO, H. DE L. ABREU. Características dos óleos de palma de variedades definidas. **[Characteristics of palm oil from different varieties.]** *Agron. angol.* No. 4, 1950 (131–9). 23 refs. [Port.f.e.]

No difference was found in the chemical constitution of oil of different varieties of *Elaeis guineensis*.

1736. XABREGAS, J. A *Thevetia neriifolia* Juss. como oleaginosa. **[*T. neriifolia* as an oil-producing plant.]** *Agron. angol.* No. 3, 1950 (121–32). 12 refs. [Port.f.e.]

A review of literature on the chemical properties of *T. neriifolia*, with results of a study of the chemical constitutents of the seed and of the seed-oil. The oil content of the seed is high, but the oil is unlikely to be marketable under present conditions, as the tree grows widely dispersed over large areas. Carefully managed plantations on dry, sandy soils, however, would possibly be economic.

1737. **Seed fat of *Macadamia ternifolia*.** *Colon. Res., Lond. 1950/51*, 1951 (51).

The fatty oil from the seed of this primitive member of the Australian flora is remarkable for its content of ca. 20% of hexadec-9-enoic (palmitoleic) acid, which only occurs in traces in most land seed fats, though it is prominent in the fats of aquatic plants and animals.

1738. HIRST, E. L. **The chemistry of plant gums and mucilages.** *Endeavour* 10 (38), 1951 (106–11). 13 refs.

Includes references to the structure of gum arabic, gum from *Sterculia setigera* and the mucilage of *Ulmus fulva*.

1739. MUKHERJEE, S., and SRIVASTAVA, H. C. **Structure of the Neem (*Azadirachta indica*) gum.** *Curr. Sci.* 20 (5), 1951 (127–8). 2 refs. A.P.B.

892.7. Fruits, Seeds. Fibres, Yarns and Flosses

See also Nos. 1736–7.

1740. MAYMONE, B., and BATTAGLINI, A. Ricerche sulla digeribilità e sul valore nutritivo delle carrube (*Ceratonia siliqua* L.). **[Studies of the digestibility and nutritive value of the pods of *C. siliqua*.]** *Ann. Sper. agr.* 5 (4), 1951 (721–44). 6 refs. [It.it.e.] C.G.B.

1741. KUMMER, H. Über Zusammensetzung und Futterwert von Bucheckernrückständen. **[The composition and fodder value of Beech nut residues.]** *Landwirtschaftliche Forschung, Darmstadt* 1 (1), 1949 (45–58). 42 refs. [G.g.] C.G.B.

Reviews the literature on the nutritional value and digestibility of Beech nuts, and gives the results of tests with residues from oil extractions. The residues are toxic to horses, but certain amounts can be fed to cattle and pigs, so long as the material is fresh and sound.

1742. HERSHEY, J. W. **Acorns—the mountain corn crop.** *Rep. Nth. Nut Growers Ass.* 1949 (39–42). C.G.B.

The American species producing the best mast for feeding pigs are Chinquapin Oak, Chestnut Oak (also yields tanbark), and Swamp Chestnut Oak.

1743. DOWNS, A. A. **Trees and food from acorns.** *Rep. Nth. Nut Growers Ass.* 1949 (177–9). C.G.B.

Gives acorn production in lb./average year for different-sized trees of Chestnut, White, Northern Red, Black, and Scarlet Oaks.

1744. WALKER, A. Plantes de garnissage du Gabon. **[Plants used as filling [for mattresses etc.] in Gabon.]** *Rev. int. Bot. appl. Agric. trop.* 31 (343/344), 1951 (322–6). [F.] P.R.

Includes descriptions and notes on the use of seed fibres of *Ceiba pentandra*, *Eriodendron guineense*, *Bombax chevalieri*, and leaves of *Pentaclethra macrophylla*, *P. eetveldeana* and *Musanga smithii*.

892.8. Heather. Broom, etc. Osiers. Canes and Bamboos

See Nos. 1048, 1692–3.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. GENERAL

1745. François, T. **Forest policy, law, and administration.** *FAO For. & For. Prod. Stud.* No. 2, 1950. pp. iv + 211.

Summarizes and comments on general practice throughout the world.

1746. Greeley, W. B. **Forests and men.** Doubleday & Co., Inc., New York. 1951. pp. 255. 22 refs. Price $3.00 (£1. 4*s*.).

A popular account of the progress made in the U.S.A. during the last 50 years, in the conception and practice of forest conservation.

902. *History of Forests and Forestry*

See also No. 1455.

1747. Lilburn, W. **A century of forestry in North-East Scotland.** *Scot. Agric.* 31 (1), 1951 (21–4 + 4 photos). O.R.E.

1748. Leiber, L. 150 Jahre Waldaufbau: eine forstgeschichtliche, waldbauliche und betriebswirtschaftliche Studie über die Markgräflich Badischen Waldungen bei Salem am Bodensee. **[150 years of forest development: a historical, silvicultural and economic study of the forests of the Margraves of Baden at Salem, on Lake Constance.]** Gartenpost-Verlag, Heidelberg 1949. pp. 139. 31 refs. [G.]

1749. Ito, G. **Studies on the history of forestry in Hokkaido. (1). Forest policy under the Matsumai feudal system.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (29–76). 35 refs. [Jap.]

Includes sections on the general forest policy of the time, forest types, the regulation of exploitation and its tightening up, conversion methods, revenue collection, timber price control, policy and enforcement of forest protection, penalties, and notes on forest personnel and administration.

1750. Rodgers, A. D. III. **Bernhard Eduard Fernow: a story of North American forestry.** Princeton University Press, Princeton, N.J. 1951. pp. 623 + 2 plates. Price $7.50 (48*s*.).

A large part of this biography is taken up by an account of the development of forestry education in Canada and the U.S.A.

903. *Forest Policy, General*

See No. 1745.

904. *General Regional Accounts of Forests and Forestry*

See also Nos. 996, 1118, 1247, 1466

1751. Roberto, A. Il territorio libero triestino, zona anglo-americana, e i suoi aspetti agrario-forestali. **[The Anglo-American zone of the free territory of Trieste and its agricultural and forestry aspects.]** *Monti e Boschi* 1951 (6), (248–60). [It.f.e.]

1752. **Denmark, May 1951. Report from the Danish National FAO-Committee to the Food and Agriculture Organization of the United Nations (FAO).** Andelsbogtrykkeriet, Odensee. 1951. pp. 107. [E.]

Includes a section on forestry (pp. 64–75).

1753. Ray, R. G. **Impressions of Norwegian and Danish forestry.** *For. Chron.* 27 (2), 1951 (96–121 + 8 photos). 6 refs.

1754. Noisette, A. La sylviculture suédoise. **[Swedish forestry.]** *Annales de l'Institut National Agronomique, Paris* 36, 1949 (133–246). 17 refs. [F.] C.G.B.

A survey of silvicultural practices in Sweden, including a review of the physical, ecological and economic factors affecting them, forest survey work, and forest tree breeding.

1755. Borovoĭ, V. Ja. Lesnoe hozjaĭstvo Narodnoĭ Respubliki Albanii. **[Forestry in the People's Republic of Albania.]** *Lesn. Hoz.* 1950 (5), (46–8). 8 refs. [Russ.]

1756. Pedro, E. R. Aspecto geral do problema florestal de Moçambique. **[General review of the forest problem of Mozambique.]** Ministério das Colónias, Junta de Investigações Coloniais, Lisboa. 1949. pp. 16 + 3 plates. [Port.f.e.]

A brief account of the forests of Mozambique, with particular reference to the Beira district, where the forests are estimated to carry about 1,344 cu.m./ha. of merchantable timber. The author asserts the importance of preventing the gradual destruction of the forests by fire, unplanned exploitation and destructive agricultural practices.

1757. Rodger, Sir A. **A visit to South Africa.** *Emp. For. Rev.* 30 (1; 2), 1951 (25–36; 140–8 + 20 photos).

A general account of forestry in the Union, with a more detailed account of the exotic plantations.

1758. **Report of the FAO mission for Nicaragua.** FAO, Rome. 1950. pp. 200. Price $2.00.

Includes a section on forestry (pp. 45–72), a list of tree species. (p. 191), and proposals for a forest survey and a forest service (pp. 194–5).

905. *Forest Statistics and Resources*

See also Nos. 885, 1118, 1466.

1759. **[The presentation of] statistical data.** Department of Forest Economics, Forestry Institute, Ministry of Agriculture, Teheran. 1950. pp. 30. 6 refs. [Per.]

A students' handbook, containing a short history and explanation of the collection and presentation of statistics, with special reference to, and examples from, forest work.

1760. Annuaire statistique de l'Union française outre-mer 1939–46. Chapitre F—Agriculture, élévage, forêts. **[Statistical year book of the French overseas territories 1939–46. Chap. F. Agriculture, animal husbandry, forestry.]** Service des Statistiques, Ministère de la France d'Outre-Mer. 1949. pp. 126. [F.]

Tables are given separately for French W. Africa, Togo, Cameroun, French Equatorial Africa, Madagascar, Indo-China, New Caledonia, Oceania, New Hebrides, St. Pierre and Miquelon, Réunion, Martinique, Guadeloupe, Guiana, Algeria, Tunisia, and Morocco.

1761. ŞEKER, F. Türkiye orman genisliği hakkında bir mütalea. [Some considerations on the extent of forests in Turkey.] *Orman ve Av* 23 (9), 1951 (261–5). [Turk.] X.

The author cites 16 sets of figures from various sources between 1932 and 1950, for the total forest area and its proportion to the total land area, varying from 6,200,000 ha. (8·7%) to 13,090,000 ha (16·9%), the Forest Service estimate of 1944 giving 10,563,400 ha. (13·8%). Following the work of the national forest survey from 1944 to 1948, with subsequent adjustments, up-to-date figures are given as:—

High forest:	in good condition	2,813,200 ha.
	in poor „	4,156,500 ha.
Coppice:	in good condition	2,053,500 ha.
	in poor „	2,966,800 ha.
	Total	11,990,000 ha.

A province-by-province analysis is included.

1762. ANDREWS, L. R. **British Columbia's wood resources.** *B.C. Lumberm.* 35 (7), 1951 (39–48).

1763. **Agricultural statistics 1950.** U.S. Department of Agriculture, Washington. 1950. pp. 791. O.R.E.

Includes data on conservation programmes, soil surveys, forest service statistics and a section on naval stores.

1764. **Forest statistics for eastern Tennessee.** *For. Surv. Release Sth. For. Exp. Sta.* No. 66, 1951. pp. 25.

Summarizes data on forest acreage and timber volume collected in east Tennessee and the Plateau region.

1765. CUNNINGHAM, R. N. **Changes in forest conditions 1936–1949: North Central Minnesota and the upper peninsula of Michigan (a preliminary analysis).** *Sta. Pap. Lake St. For. Exp. Sta.* No. 25, 1951. pp. 20.

Gives figures showing changes in stocking and allowable cut.

1766. CROMER, D. A. N. **The forest resources of Australia and their potentialities.** *Aust. J. Sci.* 13 (5), 1951 (130–5). 3 refs. O.B.D.

907. *Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc)*

See also No. 907.

1767. Naturvård i statens skogar. [Nature protection in the State forests [of Sweden].] Domänverket, Stockholm. 1951. pp. 40 + 46 plates. [Sw.e.]

91. LAND USE, LAND-USE POLICY (INCLUDING AFFORESTATION POLICY)

1768. **British African land utilization conference, Jos, Nigeria, November 7th–15th 1949. Final Report.** H.M. Stationery Office, London. 1951. pp. 52. Price 2*s*.

Includes final resolutions, and reports of subcommittees on: (1) administrative machinery and legislation, (2) the pattern of agricultural and livestock development, (3) trypanosomiasis and the tsetse fly, (4) the conservation, use and development of water resources in a rural community, and (5) staff matters, all with reference to the use of land by Africans.

1769. GLOVER, SIR H. **A tour of Latin America in 1950.** *Emp. For. Rev.* 30 (1; 2), 1951 (37–41; 149–55 + 24 photos.)

1770. STARR, W. A., and WHEETING, L. C. **Land capability methods for conserving Washington soils.** *Popular Bulletin, Institute of Agricultural Sciences, State College of Washington, Pullman* No. 200, 1950. pp. 40 + map in pocket.

A generalized land-use map, with explanation of how the land-use classification was worked out, and examples of recommended conservation practice and treatments for a number of areas in the state.

92. FOREST OWNERSHIP AND OWNERSHIP POLICY

1771. HASEL, K. Zur Systematik forstwirtschaftlicher Betriebe. [The systematics of forest enterprises.] *Forstwiss. Cbl.* 70 (8), 1951 (515–9). 5 refs. [G.]

Defines the types of forest ownership existing in Germany.

1772. VOEGELI, R. Grundbuchvermessung und Waldzusammenlegung. [The cadastral survey and the consolidation of scattered forest holdings.] *Schweiz. Z. Forstw.* 102 (7), 1951 (352–8). [G.f.]

93. PUBLIC SUPERVISION AND REGULATION OF FORESTRY, INCLUDING LEGISLATION FOR THESE PURPOSES

See also Nos. 1080, 1335, 1398, 1464, 1746.

1773. **Forestry Bill: debate on second reading.** *Parliamentary Debates (Hansard): House of Commons Off. Rep.* 489 (135), 1951 (2692–776).

1774. **Forestry Bill: considered in committee.** *Parliamentary Debates (Hansard): House of Commons Off. Rep.* 490 (141; 142), 1951 (856–980; 982–1008).

1775. **Forestry Bill: 3rd reading.** *Parliamentary Debates (Hansard): House of Commons Off. Rep.* 490 (145), 1951 (1564–621).

1776. Une législation forestière d'après-guerre en Z.F.O.A.: la loi forestière du Land Rhénanie-Palatinat. [Post-war forest legislation in the French zone of Germany: the forest law of the Rhine-Palatinate Land.] *Bull. Soc. for. Franche-Comté* 26 (2), 1951 (49–62). [F.]

Extracts from the law of 13 September, 1950, which provides a forestry code to replace the Prussian law.

1777. IRION, H. **The principal laws relating to the establishment and administration of the national forests and to other forest service activities.** *Agric. Handb. U.S. Dep. Agric.* No. 20, 1951. pp. 80.

1778. Electricité et forêts. **[Electricity and forests.]** *Rev. for. franç.* 1951 (7/8), (473–524). [F.]
A special number devoted to such questions as width of, and compensation for, power-line right-of-ways, obstruction to cableways by power-lines, and hydro-electric studies in the forest.

1779. HART, C. E. **The commoners of Dean Forest.** British Publishing Co., Ltd., Gloucester. 1951. pp. xv + 180 + 14 plates. Price 15*s*.
Gives an historical accounts of the rights of the commoners, and discusses the problem of adjusting them to present conditions.

1780. MACGREGOR, J. J. **Tree owners' obligations [in England & Wales].** *Repr.* from *The Estate Book and Diary, London* 1951. pp. 6.
A summary of the state of the law on such questions as overhanging and encroaching trees, noxious trees, trees adjacent to highways etc.

1781. PATTERSON, A. E. **The Georgia Licensing Act for foresters.** *J. For.* 49 (6), 1951 (413–8).
Describes the events leading up to, and the provisions of, an Act, signed on 21 February 1951 by the Governor of Georgia, for the creation of a board to be known as the State Board of Registration for Foresters. This is the first Act of the kind to be enacted by any of the United States. Registration, which is permissive, not compulsory, is confined to three classes: (1) those who have taken a 4-year course in forestry at a recognized school and had 2 years' practical experience after graduation; (2) those who have had 6 years' practice and can pass an examination set by the Board; and (3) those who have been practicing forestry for 10 years or more. Categories (2) and (3) will be eligible only for 5 years after the date of the Act; thereafter, only forestry graduates of class (1) will be accepted.

94. OTHER METHODS TO IMPLEMENT FOREST POLICY

1782. **State aid available to woodland owners: planting and maintenance grants, loans, technical advice.** H.M. Forestry Commission, London. 1951. pp. 9.

945.3. Education. Training

See Nos. 1750, 1788.

945.4. Research

See also Nos. 1473–4, 1597, 1687, 1788.

1783. KEEN, B. A. **The East African Agriculture and Forestry Research Organisation: its origin and objects.** [East African Agriculture and Forestry Research Organisation, Kikuyu, Kenya.] [*n.d.*] pp. 12.

1784. **Proceedings of the specialist committee on forestry research 13th–15th December 1950 [Nairobi].** East African Agriculture and Forestry Research Organization, Kikuyu, Kenya. 1951. pp. 35.
The Forest Departments of Kenya, Tanganyika, and Uganda were represented on this committee. In addition to sessions on general policy, there were meetings of study groups on working plans and enumeration, records, reproduction and regeneration, timber utilization, biology and soil science. Among the detailed conclusions and recommendations of the study groups, (which were noted and accepted by the East African Advisory Council in Agriculture, Animal Industry and Forestry, at its meeting on 20 January 1951) were the following:— *Working plans:* At present there are very few working plans in East Africa and it is recommended that the preparation of such plans should have high priority; they should be sent to the E.A.A.F.R.O. silviculturist for scrutiny of technical details. It is suggested that all working plans should be sanctioned by the government concerned and that, as far as possible, all working plans and working schemes, however simple, should be printed or mimeographed. *Experimental work:* It is suggested that the Indian manuals (Silvicultural Research Code, Experimental Manual, Statistical Manual, and Tree and Crop Measurement Manual) should form the basis of preliminary work. Modifications to East African conditions, which become evident as the work goes on, should be sent to E.A.A.F.R.O., for circulation, discussion, and agreed adoption. A typical modification is that standard breast height should be 4 ft. 3 in., to conform with the majority of the Commonwealth, and not 4 ft. 6 in. as in India. *Filing of technical information:* It is recommended that use should be made of the revised Oxford System of Decimal Classification for Forestry, and that all information filed by the territorial research officers should also be sent to the central E.A.A.F.R.O. files. *Manual of silviculture for important African species:* It is recommended that a concerted effort be made to collect together, in the form of Troup's *Silviculture of Indian Trees* all that is known of, say, the 50 most important East African species (tentative list of species attached). *Standardization of terms in the classification of East African forest types:* It is proposed that a committee should be formed to produce a standard terminology. *Subjects of research:* Recommended projects include breeding of desirable strains of Cypresses, Mahoganies, Pines and *Chlorophora excelsa*; improvement and enrichment of indigenous forest; ecology and regeneration of *Chlorophora excelsa*; nursery practice; plantation practice; natural regeneration of exotic species; trials of new species; properties and uses of local timbers; seasoning tests; wood preservation; soil and ecological surveys; effects of short-term tree-cropping (e.g. coppice) on the soil; effects of grass on tree plantations; effects of Figs on soil moisture.
A note on forest entomology in E. Africa, a report on priorities for research in forest pathology, statements of policy for Tanganyika and Uganda, and an outline of a research organization for E. Africa, are appended to the report.

946.2. Conferences and Excursions

See also Nos. 1768, 1784.

1785. Wiederaufbau der Forstwirtschaft: aus der Arbeit der DLG-Forst. **[Reconstruction in forestry: from the activities of D[eutsche] L[andwirtschafts-] G[esellschaft]-Forst.]** Deutscher Zentralverlag G.M.B.H., Michaelkirchstr. 17, Berlin O. 17. 1949. pp. 336. [G.] Price *DM*8 [15*s.* 2*d.*] (*Deutsche Landwirtschafts-Gesellschaft, Arbeiten* (*n.s.*) No. 5.)

Conference matter from various meetings of the society and its committees (for silviculture; forest protection; machinery, tools and work technique; economics; and timber economy) in 1947–9. The chief papers printed (mostly with discussion) deal with: Regeneration of clear fellings, with special reference to the establishment of mixtures (*Ziebarth*). Obtaining seed and plants suited to the site (*Thielecke*). Site mapping (*Ehwald*). '*Gruppenwechselwirtschaft*'—an untried proposal for the management of mixtures by planting in pure groups, in a chequerboard or mosaic pattern, which by the end of the rotation should be reduced by the successive fellings to a stemwise mixture, with claims for the advantages of such a method in combining species having different rotation periods, in facilitating the use of alternate forest and field crops, etc. (*Kienitz*). Interim (1948) results of barkbeetle control (*Fuchs*). Reforestation and protection of clear fellings with reference to ground vegetation and the establishment of pioneer forest (*Schilling*). Chlorate preparations for weed control on clear-felled areas (*Wurster*). Fundamental notions on biological soil improvement, the concept of pioneer forest and its realization (*Schönbach*). Choice of species in large-scale afforestation projects (*Ehwald*). Collection and storage of seed (*Mandel*). Poplar-growing (*Günther*). Proposed new procedure for reporting insect pests in the Eastern Zone of Germany (*Anon.*). The nun moth in the Eastern Zone (*Gäbler*; *Kruel*). Bird protection problems in managed forest (*Mansfeld*). Situation and prospects (1949) of barkbeetle control (*Buchholz*). Dusting with Gesarol against *Dendrolimus pini* (*König*). Net costs in forestry (*Jessen*).

95. FOREST TAXATION

1786. MAHOOD, I. **An examination of the Swedish tax system.** *For. Chron.* 27 (2), 1951 (122–8).

A comparison of forest taxation in Sweden and British Columbia.

96. FOREST LABOUR QUESTIONS, LABOUR QUESTIONS IN WOOD TRANSPORT AND THE WOOD INDUSTRIES

See also Nos. 885, 1183, 1788.

1787. BRON, H. – La responsabilité civile des propriétaires de forêts. **[The legal responsibility of forest owners [for accidents to forest workers and others].]** *Schweiz. Z. Forstw.* 102 (7), 1951 (340–52). 5 refs. [F.g.]

97. INTERNATIONAL FOREST POLICY AND OTHER INTERNATIONAL COLLABORATION

971. *Congresses, Conferences; Excursions*

1788. **Third World Forestry Congress (report of the New Zealand delegation to the) at Helsinki, Finland, 10th July to 20th July, 1949.** Government Printer, Wellington. 1950. pp. 109. Price 2*s.*

Contains the following:—(1) Report on 3rd World Forestry Congress (6–19); (2) survey of European forestry education and research organizations (20–75); (3) an investigation of methods of milling and export marketing in Scandinavia (76–102); (4) an investigation of industrial relations in Scandinavia (103–5).

1789. **British Commonwealth Scientific Official Conference, Specialist Conference in Agriculture. Plant and animal nutrition in relation to soil and climatic factors. Australia, 1949. Report of Conference.** H.M. Stationery Office, London. 1950. pp. 15. Price 9*d.*

1790. HOUTZAGERS, G., and BURGER, F. W. Het internationale populieren congres in Engeland. **[The international Poplar congress in England.]** *Ned. Boschb.-Tijdschr.* 23 (7/8), 1951 (210–9). [Du.

Describes some of the less usual varieties and hybrids seen, and discusses the cultivation of the Cricket Bat Willow and the manufacture of cricket bats.

References: 1. *Agricultura Tropical*, Bogotá; 2. *Agricultural News from Hungary*, London; 3. *British Columbia Lumberman*, Vancouver; 4. *FAO Press Release*, Rome; 5. *Foreign Commerce Weekly*, Washington; 6. *India News*, London; 7. *International Training Centre for Aerial Survey*, Delft; 8. *Italia forestale e montana*, Florence; 9. *M.L.B. Log*, Amherst, N.S.; 10. *Nature*, London; 11. *ORS News*, Java; 12. *Pakistan Journal of Forestry*, Abbottabad; 13. *Paper Trade Journal*, New York; 14. *Report of the Forest Department North Borneo*, Sandakan; 15. *Report of the Department of Lands and Forests, Nova Scotia*, Halifax; 16. *Revue forestière française*, Nancy; 17. *Revue internationale des Produits coloniaux*, Paris; 18. *Southern Lumberman*, Nashville, Tenn.; 19. *Timber Trades Journal*, London; 20. *Timberman*, Portland, Ore.; 21. *Unasylva*, Rome; 22. *Weekly Pakistan News*, London; 23. *Woodworking Industry*, London; 24. *Work of FAO 1950/51*, Rome.

Conferences. O.E.E.C. organized a conference on tropical timbers, which was held in Paris 25–26 Sept. 1951, in which the principal European organizations interested in these timbers took part. The principal object of the conference was to consider the creation of a permanent international association to diffuse information and statistics in order to increase the use of these timbers (**17**; Aug.–Sept. 1951).

Australia. The largest manufacturer of pulp and paper in Australia has established a new subsidiary to organize the annual planting of a large area of Pine in Gippsland, Victoria. The subsidiary company will also acquire and maintain Eucalypt forests for pulpwood production, and will operate lumber and sawmills. The pulpwood production of this company is ca. 50,000 cunits a year (1 cunit or cubic unit = 100 cu. ft. of solid unbarked wood, approximately the volume of a cord). Production is to be increased to 90,000 cunits a year to meet the demands of an expanded pulp mill at Maryvale, Victoria (**5**; 22.10.51).

Canada. The H.R. Macmillan Export Company's logging division is engaged on experiments to find some method of keeping Douglas Fir seed-trees standing long enough (3–5 years) after clear felling to produce an adequate seed crop. In the first attempt, trees were guyed with wire rope; this kept them standing, but the cost was prohibitive and the wires were liable to girdle and kill the trees. Seed-trees are now being left in small groups, the lower branches being removed in order to reduce the danger from wind, and this method appears to be promising [Cf. *For. Abstr.* 13 (No. 1081)] (**3**; Sept. 1951).

A Swiss company has been granted a timber concession in Labrador. It will employ 1,500 men and cut 200,000 cords of pulpwood a year, and is to pay the Newfoundland Government US $5/cord as stumpage. The company undertakes to establish two settlements with schools, churches, etc. Reforestation is to be carried out and a chair of silviculture established by the company at St. John's Memorial University, as well as a 'forestry farm' where Newfoundlanders will be taught the latest techniques in forestry and agriculture. The new corporation will have cutting rights over about 1,500 sq. miles of the Lake Melville area, said to contain 8,000,000 cords of wood. It is supposed that by cutting not more than 200,000 cords a year, no more than the annual growth will be felled. The wood will be exported to Europe for the manufacture of pulp (**5**; 17.9.51).

Preliminary investigations are being made into the problem of salvaging an estimated 1,500 million bd. ft. of timber from an area of 300 sq. miles that will be flooded when Aluminium Co. of Canada dams up the waters of a chain of lakes in the Tweedsmuir Park area some 400 miles N.E. of Vancouver. The operation would have to be carried out during 4 years, which is estimated as the flooding period. Salvage operations may prove cheap, since the rising waters would float out the logs. A sawmill near the dam is indicated, with possibly a pulpmill at Kitimat to utilize chips and small wood (**13**; 17.8.51).

The policy of supplying trees free of cost for reforestation in Nova Scotia, was continued during 1950, when 165,000 trees were planted by school children, Boy Scouts, and private individuals in all parts of the province. It is hoped to increase the supply (which is at present much less than demand) to a million a year (**15**; 1951).

Colombia. A faculty of forestry is to be inaugurated in Feb. 1952 [at the University of Bogotá?], and it is hoped that in 1953 ten agricultural engineers with special training in forestry and three instructors for a foresters' training school, will graduate from it. From 1956 it is hoped to have a regular staff of 10 forest officers in the country (**1**; 15.8.51).

Cyprus. A new Forestry College for Cyprus was opened on 27 Sept. The college, which is situated at Prodhromos, 4,500 ft. up in the Troodos Mountains, is to provide training for forest guards and foresters. In addition to studies in the basic sciences, the syllabus will include silviculture, crop mensuration, yield regulation, forest engineering and surveying, utilization and preservation of timber, and forest protection. Each of the two courses for guards and foresters will last one year. Out of the total of 36 places, 15 are reserved for students from outside, and it is expected that students from neighbouring countries will receive their training there. The director of the college, Mr. R. J. Streets, was formerly in charge of the Forester Training School, Lynford Hall, Thetford (**10**; 6.10.51).

Ecuador. Exporters of Mangrove bark from Ecuador must show proof that they have utilized at least one Spanish foot of wood for each pound of bark they wish to export, before an export licence will be granted. The regulation took effect on 3 Sept. 1951 (**5**; 5.11.51).

Eire. The Forestry Division of the Department of Lands is negotiating the purchase from the Earl of Wicklow of Shelton Abbey, near Arklow, Co. Wicklow, with 900 acres of wooded and plantable land. It is intended to transfer the Government forestry school from Avondale to Shelton Abbey, which is only a few miles away. Forest research and the demonstration plots will continue at Avondale (**19**; 13.10.51).

Finland. The floating phase of the spring logging operations was completed by the end of June, owing partly to the exceptionally high level of rivers and streams. Floating operations on lakes and along artificial channels and chutes continued later. Benefit is now being felt from chute building and maintenance projects undertaken by the Government to relieve unemployment (**5**; 27.8.51).

France. An official order has been issued to deal with the spread of Poplar canker. Owners of Poplar plantations, rows of Poplars, or isolated trees are ordered to fell without delay any trees showing signs of the disease, and are forbidden to raise or plant out susceptible species in any commune where canker is present. The interdicted species are the Balsam Poplars and *P. regenerata* (**16**; Nov. 1951).

Great Britain. A consignment of Elm felled at Poling in Sussex included a log which, when converted, was found to contain a large sheet of lead. It is thought that the lead was hidden in the crotch of the tree some 60 years ago and left there, becoming completely occluded in the tree's growth (**19**; 1.9.51).

Tests of Muhimbi [*Cynometra alexandri*] flooring in the Royal Festival Hall show that the amount of wear was only $\frac{1}{16}$-in., in spite of very heavy use, whereas wear on a stone floor in a comparable position was $\frac{3}{16}$-in. No shrinkage occurred, though in one place there was panel heating directly under the floor (**19**; 1.9.51).

Honduras. In July 1951, STICA (Servicio Tecnico Interamericano de Cooperación Agricola) began the reforestation of two mountains near Tegucigalpa, and by the end of the month had planted more than 5,000 trees. This is the first step in the long-range programme to reforest large areas of Honduras (**9**; 10.9.51).

Hungary. The government scheme for afforestation during 1952 aims at planting 200,000,000 trees on 56,000 acres; these will include fruit trees and quick growing species used for mine timbers. Shelterbelts were to be planted on 8,474 acres in the autumn of 1951 and on 8,022 acres in 1952, and trees are also to be planted along roads and railway lines and at railway stations (**2**; Nov. 1951).

India. The Deputy Food and Agriculture Minister recently stated in reply to a parliamentary question, that the Rajasthan Desert is encroaching at a rate of about half a mile annually towards the Indo-Gangetic plain. The encroachment is over a total length of 100 miles in separate stretches on a front of about 500 miles. A 10-year scheme has been drawn up for arresting the spread of the desert. The scheme envisages (1) direct reclamation measures; (2) protection and afforestation of the N.W. slope of the Aravallis; (3) creation of shelterbelts on both banks of the Luni river; (4) afforestation of the region between the Luni and the Aravallis; (5) fixation of sands at the mouth of the Luni; (6) afforestation of the banks of the Banas; and (7) fixation of sands on the sea-board of Kathiawar and Cutch. A sum of Rs. 200 million has been allocated to start the work (**6**; 29.9.51).

Indonesia. A committee was set up in July 1950 to study land use and water conservation, in view of the alarming increase in soil erosion since the Pacific War. Investigations on run-off and erosion are to be resumed to collect new data to replace those lost during the war (**11**; Oct. 1950).

International. In response to an urgent request for a study of the problems of cork producers in the Mediterranean area, the Mediterranean Forestry Sub-commission of FAO set up a working party

on cork, which met for the first time in Lisbon in May 1951; its next meeting will be held in Madrid in the spring of 1952 (**24**; 1951).

During the 9th International Congress of Entomology, the termitologists and myrmecologists present decided to set up a permanent international union for the study of the behaviour of social insects. It is intended to approach workers on the social behaviour of insects all over the world, and to organize the interchange of ideas and of research programmes and also to build up a library of reprints for reference purposes. It is hoped eventually to publish a journal. Further information can be obtained from D. Wragge Morley, Organizing Secretary, International Union for the Study of Social Insects, 14*b* Downshire Hill, Hampstead, London, N.W.3 (**10**; 24.11.51).

The Netherlands Government decided in 1950 to support the establishment of an International Training Centre for Aerial Survey, and the centre was scheduled to open at Delft in Sept. 1951. Dr. Schermerhorn, former president of the International Society of Photogrammetry, will act as Dean. Plans are ready and funds available to add a new wing to the existing Geodetic Institute of the Technical University of Delft in order to accommodate the Centre by the end of 1952. A hall of residence with accommodation for 100 students is also planned; for the present, board and lodging will be furnished elsewhere. Total fees, including tuition, will be U.S. $140.00 per month, with a possible reduction for students staying more than 6 months. For short, 1-month, courses in photogrammetry the cost of tuition will be Fl. 200 (Netherlands currency) exclusive of board and lodging. Applications for United Nations fellowships and scholarships must be sent to the United Nations through the regular channels; other applications directly to the International Training Centre for Aerial Survey, 3 Kanaalweg, Delft. There is to be a special course on aerial surveys and forestry (**7**; 1951).

Italy. In view of the present shortage of timber the State Railways have decided to make use of sleepers of *Quercus ilex* wood in addition to the Pine sleepers in general use. Ilex and Eucalypt sleepers are already being used in Sardinia (**8**; Sept.–Oct. 1951).

N. Borneo. The painting of Forest Department wooden boats with Plastik Anti-fouling ('Little Ship' Koplastic) and Koplastic Undercoat has proved very successful, giving protection against teredo damage for 6 months or more, without cleaning (**14**; 1951).

Pakistan. About 23,000 acres of newly created forest reserves in the Tharparkar District of Sind are being surveyed. The Irrigation Department has agreed to give 90 cusecs of water from the Narva Canal for raising forest plantations in this area. It is expected that this amount will suffice to raise about 6,000 acres of irrigated plantation (**12**; July 1951).

The Pakistan Railways propose to buy a million steel sleepers, with part of their 30 million dollar allocation from the loan sanctioned by the International Bank for Reconstruction and Development (**22**; 22.9.51).

The government of N.W. Frontier Province have ordered the reforestation of the Sheikh Badin Hills in the Dera Ismail Khan district. They have also approved a big afforestation programme in the Kahir plantation. Half of the cost of these schemes will be borne by the Central Government (**22**; 29.9.51).

The Pakistan Forest College and Research Institute have been moved from Upper Topa, Murree Hills, to Abbottabad, N.W. Frontier Province (**22**; 27.10.51).

Paraguay. At the request of the Paraguayan Government, FAO recently sent an expert to plan a forestry mission which will help to organize the first forest service in that country. At present only 12 species are utilized but there are known to be at least 80 other species, some of excellent quality. Exploitation is at present uncontrolled and 80% of the timber is exported as logs and squares. Experience elsewhere in South America indicates that uncontrolled exploitation of natural forest leads to disastrous erosion of mountain land and renders such areas uninhabitable within the life-time of the present inhabitants (**4**; 25.8.51).

Rhodesia. Several million cu. ft. of Rhodesian Teak (*Baikiaea plurijuga*) in dead standing trees and half-burned logs, which would otherwise be useless, may now become available as the result of an investigation made by the Forest Products Research Laboratory at Princes Risborough. The wood is too hard and abrasive for ordinary saws, but successful experiments have been made in sawing it with saws tipped with Stellite, a very hard alloy of chromium, cobalt and tungsten (**23**; 9.9.51).

U.S.A. A contract for 53 years has been made between the Ketchikan Pulp Co. and the U.S. Forest Service, for the exploitation of 1,500 million cu. ft. of timber in the Tongass National Forest,

mostly on Prince of Wales Island, Southern Alaska. The company are required to construct a pulp mill of at least 300 tons daily capacity, near Ketchigan, Alaska, to be in operation by 1954, and to increase the plant within 10 years to produce 525 tons daily. High-grade rayon, cellophane and nitrocellulose will be produced. It is expected that 600 people will be employed at the factory and an equal number in the woods. One of the main features of the agreement is a provision for conserving the area's natural resources. This includes managing the forest for sustained yield, safeguarding the salmon spawning streams and preventing the pollution of rivers (**20**; Sept. 1951).

The oldest wooden covered bridge in New England is said to be 138 years old. The State of Massachusetts has recently decided to preserve its remaining 12 covered bridges, replacing them when necessary by new ones built of treated wood. Such bridges, in addition to being attractive to tourists, cost 20% less than steel and concrete bridges, and if built of treated timber should last indefinitely. Many reasons have been suggested for the covering of wooden bridges in the first place, but it is most probable that the object was to secure longer life by protecting the timbers from the weather (**9**; 2.10.51).

A tractor-mounted saw-blade is being used to clear 20,000 Cottonwood trees, 4–12 in. in diameter, at the Boysen Reservoir, Wyoming. The 6-ft., V-shaped blade is attached to the bulldozer of a Caterpillar D7 tractor and cuts a tree at ground level at a single pass. There are teeth on each arm of the blade and a single bulldozer can clear as much as 5 acres of dense and 10 acres of more normal growth in an 8-hr. day. The operator guides the saw so that it strikes the tree near the point of the cutting edge and then forces it through the trunk in a single pass (**18**; 15.8.51).

Douglas Fir plywood manufacturers are producing a new panel material, Plyron, consisting of a plywood core faced with Masonite. The Masonite faces are not liable to grain-raising or checking and provide a good surface for decorative finishes. There is no shortage of ordinary core material and the use of Masonite will release millions of square feet of face stock for other uses (**20**; Nov. 1951).

Borgana, a substance for treating boiler water, is being manufactured from Cedar (*Thuja plicata*) waste by the British-American Co. Ltd., Vancouver, and the Portland Shingle Co., Portland, Ore. It removes and eliminates boiler scale, and controls foaming, corrosion and oil in the boiler feed process. It is non-toxic and odourless and can be used where live steam is used in the manufacturing process. Tests show that $500.00 worth of the organic constituents can be obtained from 1 ton of Cedar waste. Borgana has been on sale in the U.S.A. for the last 3 years and has proved very successful (**3**; Sept. 1951).

Arabogalactan, a good substitute for imported gum arabic, is being recovered from Western Larch on a pilot-plant scale at the Portland laboratory of the Western Pine Association. Quantities sufficient for testing by users of gum arabic are being produced. Confectioners and aspirin manufacturers are among those interested in the new product (**20**; Oct. 1951).

U.S.S.R. The results of several investigations on the tapping of Scots Pine indicate that prolonged tapping over a period of 25–30 years as practised on Maritime Pine in France, is unsuitable for Scots Pine, which becomes heavily scarred and loses value as timber. On the other hand it can stand intensive tapping without loss of vitality. It has been shown that accumulations of starch in the tree remain the same whether it is tapped up to 80% or 30% of its capacity, and also that the total amount of resin obtained over the whole period is about the same for prolonged and for short-term tapping. The cost of producing the resin, however, rises sharply with the length of period. The general conclusion is that the most practical and effective method of tapping this species in the U.S.S.R. is to tap for a period of not more than 15 years, allowing one year's rest after the first 10 years (**21**; April–June 1951).

The year 1950 marked the 40th anniversary of the first Russian Control and Experimental Seed Station (Leningrad). The Station has, during this time, made more than 36,000 analyses of seed samples and has accumulated a mass of experimental material which is now being worked on. Among the findings are the following: the length of the period during which germination takes place is correlated with the quality of the seed—the lower the germination percentage the longer the dormancy period; changes of as little as 5° in temperature stimulate germination; light is an essential factor in germination, the most favourable condition being diffused daylight; germinative energy and capacity of a given species vary according to provenance; there is a direct correlation between germinative energy in the first few days (3–7 days) and germinative capacity. On the basis of large-scale experiments it has been decided that for practical purposes a sample should contain not fewer than 500, and for scientific purposes 800 seeds (**21**; April–June, 1951).

Venezuela. A U.S. company is considering the establishment of a paper mill in Venezuela, to produce newsprint, using as raw material sugar-cane residues and tropical hardwoods (**5**; 1.10.51).